

SKIN DIVER

35c
FEBRUARY
1959

M A G A Z I N E

SKIN DIVER
MAGAZINE

SKIN DIVER
DEVOTED TO THE UNDERWATER WORLD

SKIN DIVER
MAGAZINE

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MAGAZINE

35c
NOVEMBER
1958
SKIN DIVER
MAGAZINE

SKIN DIVER
TO THE UNDERWATER WORLD
FOR 18

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Special Features!
**UNDERWATER
REGULATORS**



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Careful research has disclosed that yellow is the most effective color for visibility on the surface as well as underwater. Therefore in keeping with U.S. Divers' well known watchword "Dive with Safety," you will find our keynote for '59 is YELLOW.

ensolite wet suits

yellow rubber dry suits

"champion" and "squal" masks

deluxe tanks

"squal" foot fins

"aqua-master" and

"mistr" hoses

knife handles

"aqua-lung" and

"aquatic"

snorkels

u.s. divers co.

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Norwood, Massachusetts
Exclusive distributors for
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Pat. pend.

The only all-purpose snorkle with this special safety feature! Now for the first time, you can purchase a professional snorkle for surface swimming that will enable you to breathe safely, without inhaling water, while floating on your back in rough water. Skope Safety Snork's twin mouthpiece is the answer for tired swimmers in rough water. It helps you get back safely.

Only \$1.95 at leading sporting goods dealers everywhere.

Manufactured by Skope Safety Equipment Corporation, Norwood, Massachusetts



1959 • • •

DA "aqua-master"

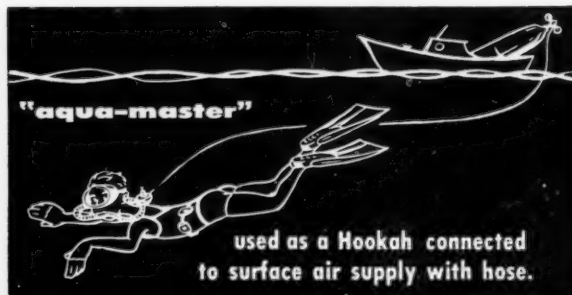
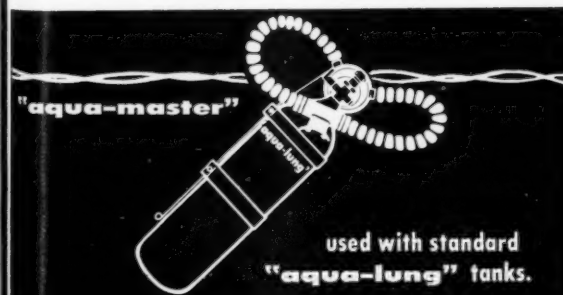
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2-STAGE
"aqua-master"
WITH VENTURI ACTION.
FEATURES A HOOKAH
ATTACHMENT.

THIS ADVANCED DESIGN
IS THE MOST VERSATILE
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\$90.00

**THE MOST ADVANCED,
LIGHTEST BREATHING REGULATOR EVER BUILT.**



u.s. divers co.

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SKIN DIVER MAGAZINE

LYNWOOD, CALIFORNIA, U. S. A.

Devoted to the Underwater World

Telephone NEVada 6-0581

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Entered as second-class matter at the post office at Lynwood, California

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editorial

For several years divers have been using compressed air underwater and the majority of them have no real conception as exactly how the air is metered to them in the correct proportion. This issue of the magazine has called on the manufacturers of breathing apparatus to explain the functions of their product. Here it is, all wrapped up in one magazine. This issue has not been compiled completely enough for you to become a scuba mechanic, that is not the intention. The material here has been prepared so you will have a thorough knowledge of the principles and functions of the regulators on the market.

The First Annual National Convention of Skin Divers will be held February 21-22, 1959, in Boston. The result of this Convention will be a National Board of Governors or National Council of Skin Divers. It is your duty as an underwater sportsman to be adequately represented at this first Convention . . . do you have a club delegate going? . . . do you have a Council delegate going?

special features

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1959 National Sporting Goods Association Show Exhibitors

— Morrison Hotel, Chicago, Ill. — Feb. 1-5, 1959 —

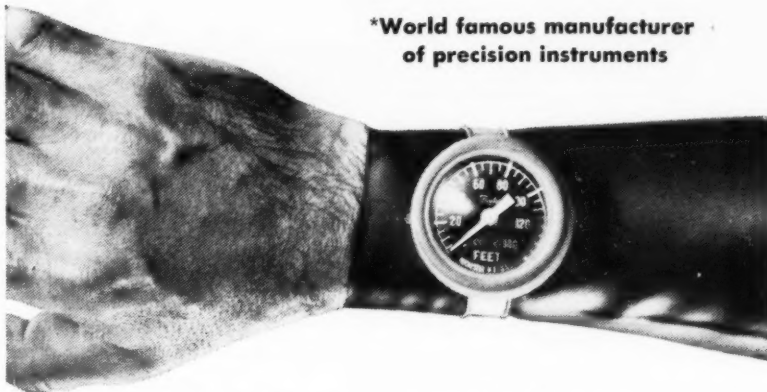
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Dacor Corporation	Booth 305
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SKIN DIVER—February 1959

LETTERS

New! From Taylor*

*World famous manufacturer
of precision instruments



Skin Diver's Depth Gage

A must for underwater safety. Pressure gage hermetically sealed in lucite. Pressure readings to 140 feet in 5 foot graduations. Accurate to within 2.8 feet. Luminous figures, graduations and pointer. #2059. Only \$9.95.



Skin Diver's Compass

Rugged neoprene rubber case with plastic strap. Resists corrosion. Large black arrow, luminous dial for easy reading. Liquid-filled dome provides steady action. Built-in leveling bubble. Companion piece to depth gage. #2959. Only \$5.95.

Taylor Instruments
MEAN ACCURACY FIRST

TAYLOR INSTRUMENT COMPANIES, ROCHESTER, N. Y., AND TORONTO, ONTARIO

... I enjoy your magazine very much and I think it is the best in the field of skin and scuba diving. I learned to skin dive a year and a half ago and I am very enthusiastic about the sport.

This year I have invented what I consider to be the ideal skin divers board, which I would like very much to see on the market and available to all skin divers.

Last summer I wanted a skin diver's board but, I could not find one suitable to my needs. They all seemed to have undesirable features such as, to heavy, small viewing plate, awkward, dangerous, fragile, won't keep you dry, and too expensive and it is easy to lose your gear. So I designed and made one that eliminates all (in my opinion) of these undesirable features, made with a maximum of \$20.00 worth of materials.

I want to know if there is any kind of service, or if you have any suggestions to make this board available to all skin and scuba divers by next season. I have a model (full size) and pictures and information for anyone interested.

George Beaumariage III
506 Pelton Ave.
Santa Cruz, California

* * *

... I would like to write to someone in the United States about diving. Please give my address in your magazine.

Zmrzly Simon
Nam. Rude Armady 14/b
Brno - Czechoslovakia

* * *

... I am an ardent reader of Skin Diver Magazine and as such would like to offer a constructive comment concerning the consistent reference made to Navy "de"compression chambers utilized by skin divers in the Letters section. The correct terminology is "re"-compression chamber.

Lt. (jg) R. V. Maloney USNR
Diving Officer
USS Tonawanda

Ed. Note: Correct, divers decompress in REcompression chambers.

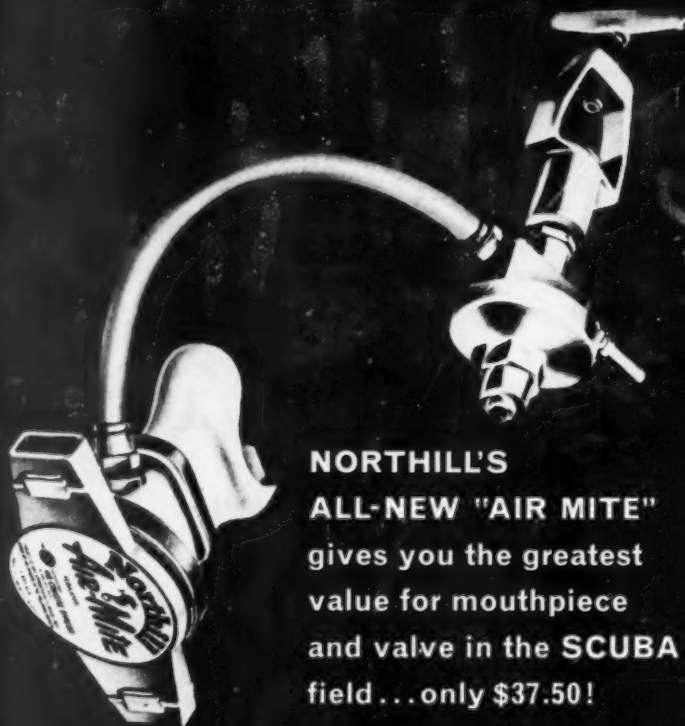
* * *

... This, I'm sure, is a must for publication in the February edition. I wrote, as your magazine requested, to the Fish and Game Commission in Sacramento, a negative letter to their proposed ideas on restricting us to minus tide abalone diving.

Received a letter today that the Fish and Game Commission is going to hold a meeting at their Sacramento office, 722 Capitol Ave., on February 27 at 9 a.m. This meeting is a must for as many skin divers to attend as possible. Size and voices have great bearing. I for one will be there with bells on to squelish this idea of limiting our diving days.

Tom Ristenpart
5400 Normandie Avenue
Oakland 19, California
KEllog 4-0284

NEW! - "AIR MITE" DIVING LUNG



**NORTHILL'S
ALL-NEW "AIR MITE"**
gives you the greatest
value for mouthpiece
and valve in the SCUBA
field ... only \$37.50!

The Northill AIR MITE 'breathes like a breeze' - making breathing under water as easy as on the surface. And exhaling through the side vents directs bubbles away from the face.

The lightweight AIR MITE fits any standard tank block, and its brilliant yellow color makes the unit easily discernible in the water. All parts are corrosion resistant. Cleaning and maintenance are as easy as turning a screwdriver—that's all you need.

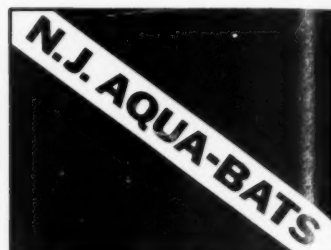
You'll breathe a lot easier with the superior safety-plus performance of the all-new Northill AIR MITE. Write to us today for free literature.

If you live east of the Mississippi, write to the Fenjohn Company, Inc., 90 Cricket Avenue, Ardmore, Pennsylvania. Those living west of the Mississippi write The Garrett Corporation, Air Cruisers Division, Belmar, New Jersey.



THE GARRETT CORPORATION
AIR CRUISERS DIVISION
BELMAR, NEW JERSEY

LETTERS



... Just a line to challenge the "first" of the Detroit Bubblers Diving Club regards the use of the Divers Flag in the club emblem. (You probably will receive several letters on this theme.)

The enclosed decal was adopted when our club formed this past August.

We also noticed in the October issue of "Skin Diver" that a club in Oklahoma uses the name Aquabats. We would be interested in hearing from any other club with the same name.

Our group is made up by the older scouts of troop nine B.S.A. in line with their new Explorer Scout program, and while we have been skin diving on a small scale for about two years we have just started scuba diving.

New Jersey Aqua Bats
239 N. 8th Street
Paterson 2, New Jersey

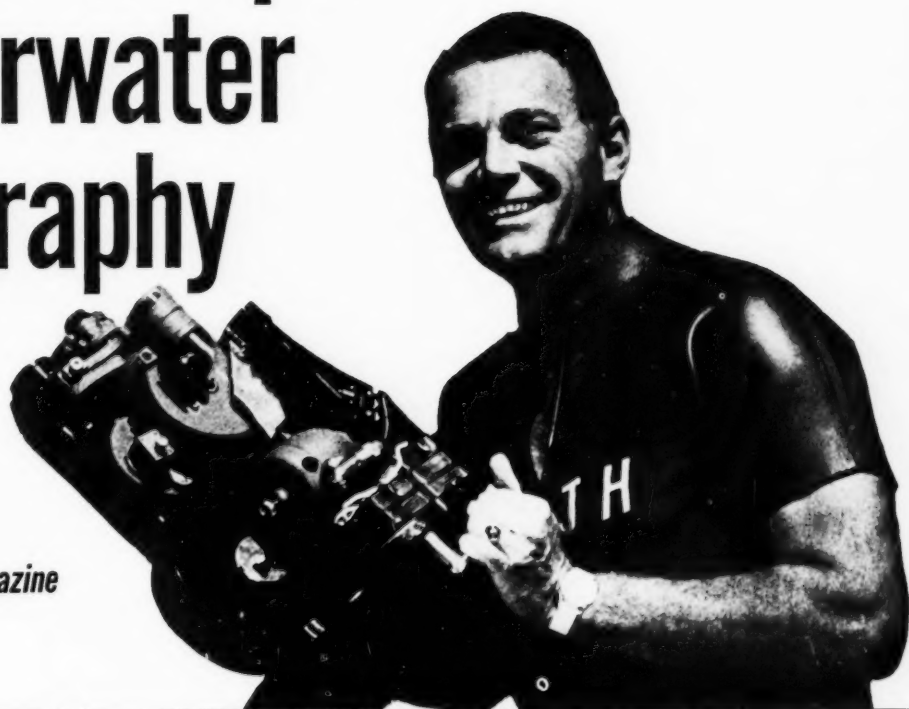


... Please check page 48 of your December 1958 issue ... that bit about being the first club to incorporate the Divers Flag. We are but 14 months old and adopted the enclosed patch the same month that the flag was made official (over a year). It is the official red with the white stripe. We are already the largest club of active divers in Northern California with over 50 divers. After being organized just five months we took third place at the AAU Central Calif. Meet 1958 and 8th place at Laguna Beach, ssssooooo look out for us this next year.

Sonoma Co. Reef Runners
Santa Rosa, Calif.

SKIN DIVER—February 1959

A New Concept in Underwater Photography

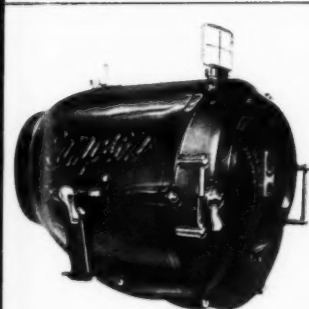


One-man Operation

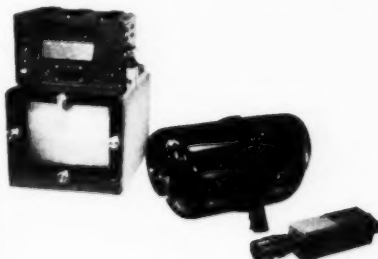
Built-in Light Meter

Finger-tip Controls

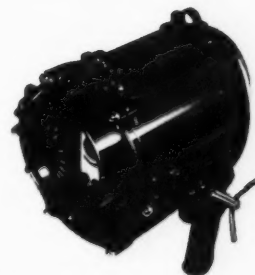
400-foot Displacement Magazine



"400"—35mm operator's eye-view of the 35mm housing showing the pistol grip handles affording finger tip controls for focus and f. stop—large sweep hand dials for quick, clear calibration readings. The unit is powered by 12-volt Yardney D-cell battery.



"TV-500" Television closed circuit unit with Spectra TV monitor and camera SAMPSON-HALL housing will accommodate other TV cameras. Operational depths—500 ft. unpressurized. For directors who like to stay dry and topside—install TV system in the "400" motion picture housing.



"Pro-Sportsman"—The 16mm Pro-Sportsman underwater housing designed for the semi-professional photographer, encompasses all the features of the 35mm and Television housings. High grade aluminum casting, heat treated to withstand external pressures. Because of the close tolerances which are maintained pressurization is not required in depths less than 250 ft.

Over a period of 15 years, inventor-designer Herb Sampson and Jon Hall have worked together to create the perfect underwater camera housing. Today the Sampson-Hall Co. has achieved its goal with a one-man operated underwater camera housing adaptable for all underwater photography. It maintains neutral buoyancy at all depths. This amazing simplicity of operations allows the amateur to capture footage comparable to that of the professional. The Sampson-Hall underwater housings are designed for the Bell & Howell 8mm Eyemo with 400-foot magazine and the 16mm Filmo. The Television underwater housing will accommodate the I.T.&T., RCA, Spectra and GE industrial cameras and others.



Price schedules upon request.

Introducing 2 GREAT NEW



World's Finest Dry Suit

NEW IMPROVED SKOوبا-"totes". The same easy-to-put-on . . . stretchy . . . no bind suit that many thousands are using today. Now better than ever with new positive **RING-LOK WAIST SEAL**, New **DOUBLE REINFORCED, NON-SKID FEET**. And now in your choice of **ONE-PIECE HOOD AND SHIRT**, or separate hood and shirt. Test the one-piece, seamless construction. Feel the smooth strength of the tough, anti-grab rubber that slides on easily with no talc required. Compare this suit with others selling at \$50.00 and more!

#2120-K (with hood and shirt in one piece) **\$34.95**
#2020-K (with separate hood and shirt)

New! Shirt and hood made in one-piece. (optional)

New! Ring-Lok Rail and Ring Included

100% Seamless Pure Gum Rubber

New! Double-Reinforced Non-skid feet.

NEW EXTRA LIGHTWEIGHT TIGER SKOوبا-"totes"

\$19.95
complete

IN SAFETY YELLOW

Solid bright yellow gum rubber for top-water safety. A beauty! Made lighter. No sacrifice in toughness, stretch, or ease in putting on. Don't let the price fool you. This suit compares with others at \$35.00 and more. 100% Factory Guaranteed.

#3130-Y (with seamless hooded shirt)
#3030-Y (with separate hood)



SIZE CHART

SIZES	WAIST	HEIGHT	WEIGHT
Extra Sm.	24 to 32	5'2" to 5'7"	110 to 135
Small	30 to 34	5'5" to 5'9"	135 to 160
Medium	32 to 36	5'7" to 6'	155 to 180
Large	34 to 38	5'10" to 6'1"	175 to 210
Extra Large	36 to 40	6'0" to 6'4"	200 to 240

ASK YOUR FRIENDS! These 100% dry suits are converting even the "wet-suit boys" to this **warmer, more comfortable** way to dive. Skooba-"totes" are mass-produced on precision machines to bring you highest quality professional suits at down-to-earth prices. Made by the makers of "totes", America's largest selling lightweight rubber footwear for men, women, and children.

100% FACTORY GUARANTEED

FREE

**\$4.95 PURE GUM RUBBER
SKOوبا SWIM TRUNKS**



BUY a \$34.95 SKOوبا-"totes" suit from a dealer. Then mail us this coupon along with box-end label showing style number 2120-K or 2020-K and store sales slip. Please enclose 25c to partly cover postage and handling. We will send you a pair of Skooba-Trunks promptly. Be sure to print your name, address and specify size (S. M. L.)

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If your dealer can't supply—you may order from the factory. Enclose check or M. O. and this coupon. Sorry, no C.O.D.'s.

HURRY! THIS COUPON NOT GOOD AFTER MARCH 25, 1959.

(Not good on orders for \$19.95 suits.)

DACOR DIVING LUNGS

USED AND APPROVED BY US NAVY

Selected as best and used exclusively by MICHIGAN STATE POLICE

**Join the swing
TO DACOR**

FOR SAFETY, QUALITY, PERFORMANCE, FEATURES, RUGGEDNESS, DEPENDABILITY, ECONOMY OF OPERATION, AND PRICE, THE DACOR LUNG HAS NO EQUAL.



**ONLY DACOR PROVIDES:
Double Diaphragm, Two Stage**

**Regulator with Double Safety and Greater Performance
for the Diver --**

OTHER DACOR FEATURES:

- Two Stage Regulator reduces air pressure twice, assuring uniform breathing regardless of tank pressure.
- The Diaphragm which operates the air demand valve is not exposed to the water surrounding it. Therefore it is not subjected to any movement except that caused by the normal breathing cycle.
- If either one of the diaphragms should become damaged or inoperative, the regulator will continue to function efficiently, assuring double safety to the user.
- Famous Dacor mouthpiece with original off-set design completely eliminates interference with face mask and is odorless—tasteless.
- Metal parts are brass and stainless steel.
- New Neoprene "collapse proof" hoses—Ozone, sun and salt water resistant.

DACOR CORPORATION

P. O. BOX 551, EVANSTON, ILL.

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RESERVE VALVES:**

Exclusive design with special depth compensating feature—more reserve air at greater depth. Pull-Rod type.



Double Reserve Valve \$39.95



**Single
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\$17.95**



**DACOR PRESSURE
GAUGE**

With relief valve for easy removal

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DOUBLE TANK LUNG COMPLETE:

With Reserve Valve.....**\$219.50**

REGULATOR COMPLETE:.....\$74.50



SURF BOARD

designed for

SKIN DIVERS

Available in

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- Speckle Yellow
- Speckle Red

SPECIAL

\$39.95

(Washington residents add 3 1/2% sales tax)

\$10 deposit on all CODs. Shipping costs collect.

KK SURF BOARD

Features Side Handles that enable a diver to easily hold on or attach extra equipment. Load capacity over 350 pounds. More stability because it's 24 inches wide at the widest point. 8 feet long and 4 1/2 inches thick at the after end. Weighs only 37 pounds. Finished in multi-color with durable water-proof plastic coating.

Write for FREE Illustrated Folder

KUSTOM KRAFT

260 OLYMPIC NATIONAL BLDG.
SEATTLE, WASHINGTON

Puget Sound Ling Cod Attacks Diver

By RICHARD F. WALD

During a diving weekend in the San Juan Islands in Puget Sound, a seemingly non aggressive ling cod made a pass at me and—well that's jumping ahead of my story.

There were over forty divers from Canada, Washington and Oregon in the San Juans that weekend.

Three of us were diving when I became separated from my diving partners. I had two speared fish and had decided to come up. Then without warning I felt a hard sharp object hit my left elbow. Wheeling around I saw that a large ling cod had grabbed my elbow. After shaking him loose he came at me from the front, ignoring the two fish I had speared. I hit him with my spear point and when he turned I shot him in



The aggressive Ling Cod after he was beached by the diver. Dick Wald, above, was twice attacked by this 47 pound fish while diving in the San Juan Islands.

the head and brought him to the surface.

The ling cod was 53 1/2 inches and weighed 47 lbs. He left numerous deep tooth marks in my arm right through a quarter inch wet suit.

The ling cod is the only large edible fish in these waters and grows to a size of over a hundred pounds and up to six feet in length. The record for spearfishing is 58 pounds. They have never been known to attack a diver except after being speared, when they bite at the fins and legs of the diver.



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America's finest rubber suits



Aquala dry suits are designed for free swimming comfort in any position without binding or pulling. A full roomy fit is water-tight yet allows plenty of room for underclothing.

The body-contoured design of the wet suit is the result of years of research. Made from copyrighted patterns, the suit clings to your body like a second skin, but without excessive tension. It allows full freedom of movement without binding. Reduced stress gives rubber longer life.

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THE ORIGINAL PERFECT DESIGN

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1. Manual control regulator clearing button
2. New exhaust keeps bubbles from face
3. 360° free turning hose cannot twist

SEE IT and other outstanding Diving Equipment at N.S.G.A. Show, February 1-5, Rooms 874-875, Morrison Hotel, Chicago, Ill.



Beautiful ZALE PARRY internationally famous holder of women's S.C.U.B.A. Diving Record... motion picture and T.V. star... uses Sportsways WATERLUNG... finds it has given her a completely new sense of freedom underwater.

Sportsways WATERLUNG

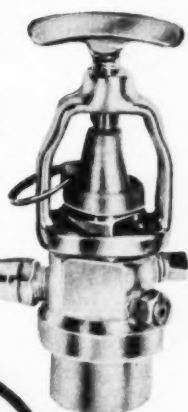
proudly presents the

...conceived on principles that have no precedent in design and engineering! A single hose two stage regulator... the world's finest, most advanced self-contained underwater breathing apparatus... with depth-compensated automatic air reserve!

The WATERLUNG has the scientific design • features • workmanship • materials • performance... that herald a new era... makes the future of S.C.U.B.A. diving a reality today!

Tried, tested and proven by hundreds of the world's foremost S.C.U.B.A. divers and diving authorities who agree... here at last is the ultimate... long needed... long awaited!

PAT. PENDING



The Waterlung was created by Samuel Lecca, Sportsways brilliant, world renowned underwater research engineer.

ALL ACCLAIM THE INCOMPARABLE EASE OF BREATHING, RELIABILITY AND SAFETY, SIMPLICITY AND RUGGEDNESS OF CONSTRUCTION, MINIMUM ENCUMBRANCE TO MOVEMENT AND UNDERWATER OPERATIONS AND EASE OF MAINTENANCE!

The WATERLUNG is the only regulator made... that makes it possible for the Sea-Vue High Pressure Reading Gauge to become an integral part of the first stage itself! S.C.U.B.A. divers everywhere are thrilled to know that this most necessary safety factor... has at last become a useful and practical component!

The WATERLUNG Demand Regulator is available with or without the Sea-Vue High Pressure Reading Gauge. Sea-Vue High Pressure Gauge can be purchased separately and installed when desired.

- Cat. No. 300 — WATERLUNG Regulator.....retail \$59.95
- Cat. No. 302 — WATERLUNG Regulator with Sea-Vue Pressure Gauge.....retail \$79.95
- Cat. No. 301 — WATERLUNG Regulator with Tank and Harness.....retail \$117.50
- Cat. No. 303 — WATERLUNG Regulator with Sea-Vue Pressure Gauge, Tank and Harness...retail \$137.50
- Cat. No. 304 — WATERLUNG Regulator Carrying Case.....retail \$8.95

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Captain Walter B. Miller... Director of Range Operations, U.S. Naval Missile Range Center, Point Mugu, California, has now selected the WATERLUNG for his personal use. He has used every type S.C.U.B.A. made... in his many years of diving. He is shown here with the WATERLUNG... coming aboard ship after diving operations off the Pacific Coast.

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New!

THE SUCCESS OF THE V-DESIGN in men's wet suits has prompted us to incorporate it's many advantages into our suits for girls. The elimination of underarm seams not only insures a longer life for your suit but allows a better fit to the female figure. The same top quality neoprene, workmanship and custom tailoring which have gone into all Dive N' Surf suits is here too. So now gals it is possible to have V-Design in a definitely feminine suit for diving, surfing or skiing.

ADDITIONAL MEASUREMENTS are required for the women's V-Design and it is requested that you send for our new suit charts along with free samples of suit materials and price list. Your order completed in four days from date received and all workmanship and materials are unconditionally guaranteed.

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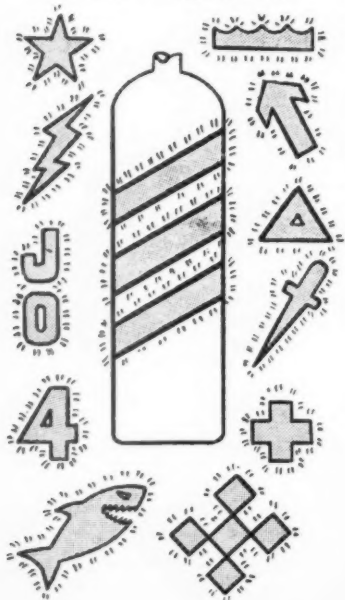


FRontier 9-1473
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DECORATE YOUR TANKS IN "PRO-Glo" FLUORESCENT COLOR

PRO-Glo: New Brilliant "Blaze Orange" (Mil-Standard Sea-Air Rescue Color) on Waterproof Vinyl Sheets—Self-Adhering—3 for only \$2.

Ideas for using PRO-Glo.



Another PRO "first"! Nothing else like PRO-Glo. "Glamorize" your air cylinders with science's brightest fluorescent color. "Glow" in daylight—many times more visible. No "painting", no mess. Won't smear, crack, flake off, or loosen. Easy as "scotch" tape to apply. Dazzling, vivid, "Blaze Orange" with contrasting jet black border-trim permanently processed on waterproof Vinyl plastic sheets (2 1/2"x19") with pressure-sensitive adhesive on backs, paper-masked. Peel off mask paper and press PRO-Glo on tank. Sticks like skin on a fish. Water won't loosen. Can be removed and re-applied if desired. Use sheets "as is," or cut your own designs (numerals, initials, emblems, etc.) PRO-Glo kit includes 3 sheets and directions for only \$2 (postpaid in U.S.). Fill in and mail coupon (at right) with cash, check, or money order today. Money-back guarantee.

There's a "PRO" to Fit Your Budget!

(Top right) PRO "Treasure Chest" (1. PRO "Custom" Scuba, 2. Fins, 3. Mask, in 4. case), \$160. PRO "Custom" (not including mask), \$125. PRO Mod. 57, \$79.95. Write Rose Aviation, Inc., Dept. 114, Aurora, Ohio; or see your dealer.



Rose Aviation, Inc.
Dept. 114, Aurora, Ohio

Enclosed: \$_____ for _____ PRO-Glo
Kits at \$2 each.

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THE Northhill Air-Mite, an outstanding new development in underwater breathing apparatus, is produced by The Garrett Corporation's Air Cruisers Division.

Like the Air-Lung, it has been designed to meet rigid U. S. Navy specifications.

Small and of simple but highly efficient design, the Air-Mite has given a major boost in safety and economy to the sport of scuba diving. It fits any standard tank valve.

Active divers will immediately recognize a prime advantage in integration of the air supply regulator and mouthpiece as a single unit in the Air-Mite. Placement of the air regulator close to the mouthpiece and therefore constantly at the exact depth level of the diver's mouth provide a significant refinement in ease of underwater breathing.

The Air-Mite configuration also permits the diver to carry his air container low on his back for swimming ease on the surface. He can keep his head above the water and breathe atmospheric air without having to lift the container out of the water. Tank mounted regulators require that they be carried high on the back for the best hydrostatic position to give ease of breathing in all swimming positions.

PRINCIPLES OF AIR-MITE OPERATION

Passage of air through the Air-Mite is exceedingly simple. When the inhalation valve is opened, the air flows through directly to the mouthpiece and from there is breathed in by the diver.

In exhaling, the air follows a similarly short and concise route. Going back through the mouthpiece, it is blown directly at the exhalation valve, which opens and vents the air to the water.

To direct exhalation bubbles away from the face, vents extend out from the sides.

DETAILS OF AIR-MITE FUNCTIONS

The inhalation valve on the Air-Mite is a tilt type, held in its seat against the air pressure by a conical shaped spring. With inhalation, a diaphragm motivated by water pressure pushes on the tip of the tilt valve. This "tilts" the valve in its seat, producing an opening for the inward flow of air.

When air is demanded and leaves the supply tank, it enters the Air-Mite system through a reduction valve which lowers the incoming air from tank pressure to 75-100 psi. A short length of pressure hose then carries the air to the

Air-Mite regulator. After the air enters the tilt valve opening it has less than three inches to travel to reach the diver's mouth.

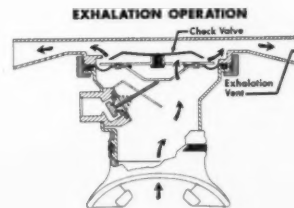
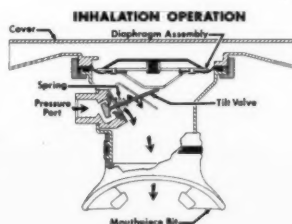
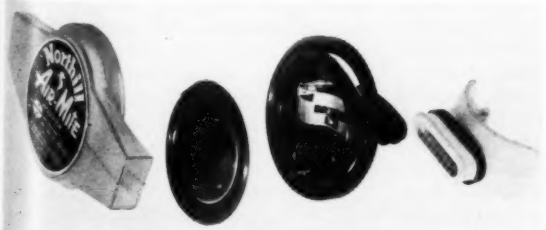
The hydrostatic advantage of regulator location at the mouth and the high flow capacity of the demand valve give the "Air-Mite" a low breathing resistance factor. This is a notable asset in air supply conservation and ease of breathing, especially during heavy activity and deep dives.

Similarly, in exhaling, the closeness of the large exhalation valve to the diver's mouth, and its unique location in the center of the diaphragm makes it easy to open and vent out the used air. Actually, the exhalation valve is a check type valve which remains closed, except when forced open by exhaled air.

The housing is made of corrosion resistant molded fiber glass. All metal parts and the neoprene diaphragm assembly are also corrosion resistant.

SERVICE AND MAINTENANCE

Cleaning and maintenance of the Air-Mite are easy, and the unit can be serviced without tools. The housing cover can be removed by hand for inspection of the parts and washing with fresh water.



VIKING REGULATOR

CHRISTENSEN TOOL &
ENGINEERING, INC.

11 Commerce Street
Norwalk, Connecticut



IN 1955, prevailed upon by the urging of the skin diving friends of its principals, Christensen Tool and Engineering, Inc., of Norwalk, Conn., embarked on a program to develop a demand air regulator that would embody features not otherwise available.

An association, dating from 1946, with the development and production of items which have found wide usage in military aircraft and in electronic tabulating and computing mechanisms had fitted the Christensen organization with the necessary technical ability, skilled personnel, and versatile equipment.

Kaj Christensen, its president, an imaginative Dane whose ancestral heritage was to be reflected in the characteristics and name of the new product, together with treasurer and technical advisor John Herbert, a diver himself, formed the nucleus of the group that was to spend the next three years in experimentation, test, and evaluation to achieve this goal.

Early in 1958 the services of George Swindell, a prominent figure in Connecticut diving circles and a professional diver of merit, were enlisted to provide insight into, and devise the solutions for, those final problems of breathing effort, reserve control, air flow, and overall comfort that so often have confronted those who dive for pleasure or for pay.

A series of tests followed: many in tropical waters; chamber tests at depths in excess of 250 feet; plus countless hours of "dry testing". This, then, has led to the introduction of the "Viking", a basically new regulator: one that has a new configuration; one that uses new materials; one that offers new safety features.

The Viking is a two stage demand air regulator. It consists of a first stage valve which discharges air into the in-

termediate pressure chamber (hereafter called Chamber "A") and a second stage valve which discharges the air from Chamber "A" into the Breathing Compartment. The Chamber "A" housing has a movable "O" Ring seal on the lower end; and as high pressure air is introduced into Chamber "A", the housing tends to rise but is opposed by a main spring. The normal chamber position is a balanced one wherein Chamber "A" pressure is balanced by the main spring reaction. The top of Chamber "A" carries the second stage valve. The second stage valve is operated by a system of levers attached to the breathing diaphragm.

HIGH TANK PRESSURE. When no air pressure is on the regulator, the first stage valve is open and the second stage valve is closed. As air is introduced, it flows through the open first stage valve until the chamber pressure in Chamber "A" has built up to a point which causes the movable carrier to press against the main spring. The carrier continues to rise until it clears the top of the first stage valve, at which point the linkage is positioned for breathing.

Thereafter, the Breathing Compartment pressure is reduced by the diver's inhalation, and ambient pressure on one side of the diaphragm operates the second stage valve through the lever system.

The second stage valve bleeds air from Chamber "A" and the loss of this pressure allows the main spring to push the carrier downward until the first stage valve is again opened, allowing the re-introduction of high pressure air into the intermediate chamber.

The cycle is completed when the diver exhales and the Breathing Compartment pressure balances the ambient pressure. At this point the second stage

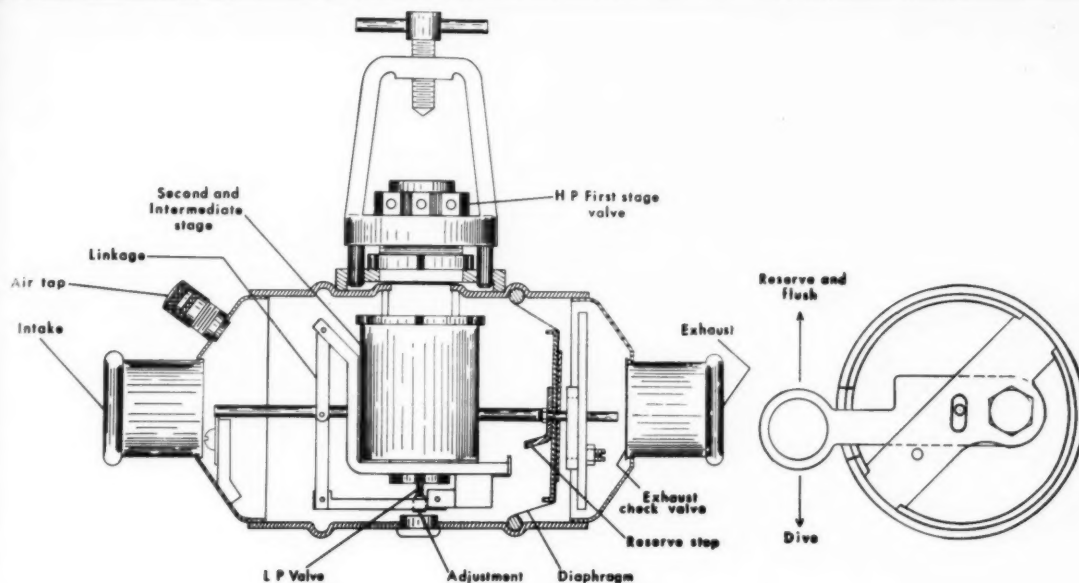
valve closes and the cycle is begun again.

RESERVE WARNING. During the period of breathing down the air, a mechanical restriction to the reciprocal action of the Viking is automatically introduced. When a pre-set intermediate chamber pressure of 250 pounds per square inch is reached, the air flow is positively restricted—an immediate and absolute first warning to the diver that he must go into reserve. A quick downward flick of the Reserve-Flush Arm removes the restriction, puts the unit in "reserve", and restores normal breathing.

LOW TANK PRESSURE. The intermediate chamber is set to be maintained at 250 p.s.i. When tank pressure drops to this level, the pressure in the intermediate breathing chamber is no longer sufficient to maintain the carrier in the "up" position. The main spring gradually forces the carrier downward until it comes to rest in a lowered position, which brings the first stage valve into a "full open" position. This gives the regulator the ability to deliver large volumes of air with a minimum breathing effort when it is in "reserve".

TERMINAL AIR WARNING. The second stage valve is designed so that when tank pressure drops to approximately 80 p.s.i., a slow by-passing of air is allowed which creates an immediate steady flow condition. This is the second warning to the diver and the signal that he must make his ascent. At this time the diver can still get the last ounce of air in the tank if need be.

A steady flow condition at any time other than when the regulator is in "reserve" is a Reserve-Flush Arm Position Warning—an indication that the regulator has accidentally been put in "reserve". Should this happen, returning the Reserve-Flush Arm to "Dive" posi-



A cut-away view of the VIKING showing its primary components and construction.

tion immediately stops the constant flow. This feature eliminates the possibility of breathing by the reserve and gives assurance to the diver that at no time is he using up part of his air reserve unknowingly. Putting the regulator in "Reserve" either accidentally or intentionally and then returning it to "Dive" in no way effects the air reserve.

FLUSHING OF WATER FILLED HOSES. Elimination of water from the hoses can be accomplished with the mouthpiece in place. Putting the Reserve-Flush Arm in "Reserve" position operates the diaphragm mechanically and causes a constant flow which conveniently expels the water from both hoses and from the regulator should it too become flooded.

BREATHING ADJUSTMENT. Breathing effort is pre-set. As with any precise mechanism, rough usage, wear and tear, or temperature changes can cause maladjustments. It may be re-adjusted by the user, or breathing effort may be increased or decreased to suit individual tastes or requirements, by means of a simple set screw adjustment. This is particularly significant to those who use a regulator as a work-piece because it permits the diver to work on his back without an excessive air flow through the mouthpiece. If strenuous physical effort on the part of the diver is involved, he can set the unit to "bleed" slightly so that his air comes to him with little or no breathing effort.

AIR TAP. A pressure tap at one bell end provides a means of attaching the "Viking Safety Tube", a device designed for use in an emergency to per-

mit two divers to breathe through the one regulator. It is recommended that the "Tube" be attached when a dive will be made to great depth. Putting the regulator in "reserve" allows an ample flow of air to both divers.

The Air Tap also provides a means of converting a dry suit to a constant volume suit and a means of camera case pressure equalization.

RESUSCITATOR. A combining of the constant flow feature with manual control of air to the mouthpiece permits the Viking to be used as a resuscitator. This usage should be restricted to those fully qualified in lifesaving techniques.

CONSTRUCTION AND SPECIFICATIONS. The main housing is heavy .062 wall chrome plated brass. Overall length is 7 inches. Hose mounts fit standard hoses, and the Yoke fits "K" and all standard valves. Internal parts are stainless steel, brass, naval bronze, neoprene, and, where wear resistance is paramount, teflon coatings are employed. Gross weight is 3.5 pounds.

Large valve ports result in a low pressure drop and high capacity flow through both the first and second stage regulation. Operating pressures are 2,500 p.s.i. maximum and 250 p.s.i. minimum in first stage regulation. Maximum flow is in excess of 30 cu. ft. per minute.

CARE AND MAINTENANCE. The Viking is sealed at the factory and requires only normal care. A simple clear water rinse of both regulator and hoses after use will maintain it in trouble-free condition. It is guaranteed, exclusive of damage from accident, neglect, misuse, or unauthorized repairs, for one

year. The guaranty may be renewed for an additional year, or successive years, through the provisions of a nominal charge factory overhaul policy.

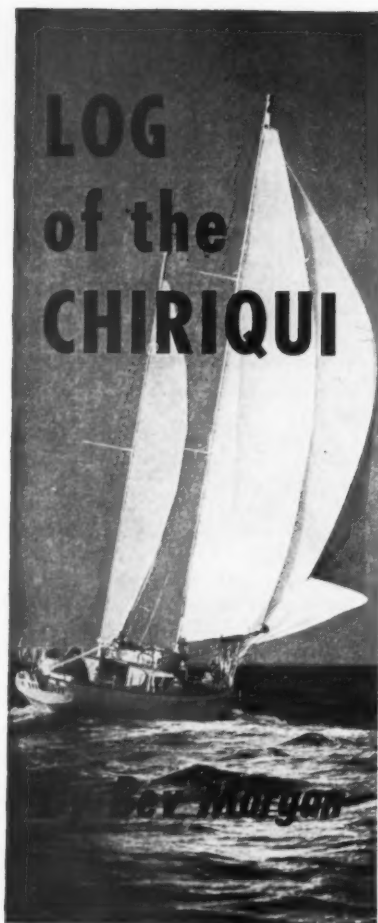
PAKBOARD AND TANK. A Pakboard and an extra capacity Tank complete the Viking rig. The Pakboard, weighing 1.25 pounds, is one piece #13 gage aluminum, contoured to fit the back naturally, and color anodized for corrosion resistance. It is available in an Adult and in a Junior size. A tank band-slot arrangement provides for single tank to double tank mounting on the same "Board" in a matter of minutes using only a screwdriver.

The harness is soft, wide nylon webbing. A crotch strap has been eliminated for comfort and ease of adjustment. Hardware is stainless steel and chrome plated brass. The buckle is stainless steel and a "quick release" type. This, plus the use of shoulder strap snaps, makes release instantaneous.

The 75 cu. ft. capacity tank is neutral buoyant, and resin coated for corrosion resistance both inside and out. It weighs approximately 30 pounds empty, and approximately 35 pounds with 2,400 p.s.i. air. It will take a 10% overload, and may be transported under I.C.C. regulations.

The valve is a standard "K" type. A unique base design permits storage in an upright position; and, when wet after use, permits standing with the regulator and harness hanging clear of dirt and grit.

The Viking line is manufactured at and distributed from the Norwalk factory.



The story thus far: After losing a crew member, (he returned to the States), six divers are continuing on a voyage along the Pacific Coast of Mexico and Central America. They had several experiences with sharks at Tres Marias Islands, off the Coast of Mexico. After a short stop at Acapulco last month, they continued the voyage.

COCOS ISLAND

"Log of the Chiriqui" will be featured each month as the ocean yacht sails to new diving areas in the Pacific . . .

WE WERE anchored in dead calm water behind a spit of land called Puntarenas, in Costa Rica. Now Puntarenas is a somewhat modern Central American town. They even have an asphalt main street. At the last survey, it came to light that for every man in the country, there were eight women—men are outnumbered eight to one. After a few days to reprovision the Chiriqui with food and fuel, we prepared to sail. Then the job of rounding up the entire crew started. When only ten minutes of tide was left we slipped across the sand bar to the outer harbor. We were now five, having lost another member of the crew, Ron Church. He departed for the States by air.

When we cleared the Coast of Central America, the routine watches were started and all was proceeding as usual. I read several books concerning our next destination, Cocos Island. The island lies some four hundred miles off Costa Rica. It is about four miles wide and roughly the same in length. It is very rocky and rough, being entirely covered with a thick jungle.

We were approaching at the rainy season season, and the heavy rains began to sweep over our decks as we plowed through heavy seas toward Cocos. Because of the abundance of fresh water on the island, it has been visited by many ships as far back as the seventeenth century. First came a bunch of buccaneers known as the "Merry Boys" in their ship the "Batchelor's Delight". After taking the town of Leon they sailed, heavy with gold and silver, to Cocos. There, Ed Davis, the captain, had the ship careened, buried his treasure and gave his men a rest ashore. Then he sailed the Batchelor's Delight to Guayaquil, and led his men in an attack. They made a good haul, the division of which gave each man of the crew twenty thousand dollars. After another quick visit to Cocos to hide the new spoils, the Merry Boys sailed around the Horn to Jamaica. Here they "surrendered to His Majesty's Mercy," and were pardoned by King James II. Then Davis settled in Virginia, until 1702. In that year he attempted to reach Cocos in a small boat named the

"Blessing". But he and the boat vanished, presumably long before reaching Cocos.

Another treasure, the greatest of all times, was deposited on Cocos in 1820. Under the shadow of Simon Bolivar, the wealthy people of Lima, Peru, attempted to send their riches, and that of the church and government out of the country. They enlisted the aid of one Captain Thompson of the ship "Mary Dear" to carry it away. The value of the Cathedral treasure alone was sixty million dollars, the state and personal treasures aboard can not be estimated. After loading, they put out to sea, their destination to be announced by several local authorities once at sea. Captain Thompson changed their plans. He and his crew massacred them and threw their bodies into the sea. The treasure was buried on Cocos.

Now this was just over one hundred years ago, and pirates had little chance in those days. The British frigate "Esperanza" soon caught up with them and all aboard were hanged, except two. One of the survivors was Thompson. They were permitted to live when they promised to show the English the location of the treasure. Once at Cocos, the two pirates escaped to the interior and nearly starved before a whaler took them off. Thompson's companion died shortly thereafter, and Thompson never did make it back to Cocos. Before he died, however, he left a map of the location of the treasure.

Many people have tried to find the treasures, and the stories connected with these ventures could fill a book. The tales are full of mutiny and murder, but if any treasure was ever found, no one would admit to it.

As mysterious as its reputation, Cocos appeared off our bow, its peaks covered with low clouds. We entered Chatham Bay and anchored in ten fathoms of clear, blue water. The anchorage was good, with ample protection from the present weather. The clear water urged us to hurry the diving launch over the side. In an hour or so three of us, Lowell Thompson, Ramsey Parks, and myself, were in the water. The first thing that happened, we were surrounded by small (4-5 ft.) white tip sharks. At least ten of them nosed about us as we reached back into the boat for our "shark billies". We were mad now, all this clear water, and the damned sharks thought they could scare us off. Swimming rapidly toward the nearest beasts, all three of us began to poke and beat their hides. The sharks scattered wildly, retreating out of sight. We looked at each other in surprise, perhaps we had come up with the answer to the shark problem. The test was about to occur. Three big sharks swam by (8-10 ft. long). The size of these

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newcomers was enough to scare hell out of us. We were glued in position, breathing heavily. The largest of the three came straight at Lowell and received a poke in the snout from the "shark billy". He veered off and came in again. That did it. We all converged on him, poking and beating. Away went the sharks, and we finished our dive without incident.

The water temperature here is eighty-two degrees, but we had been in ninety degree water for two months, and felt chilled after a short while. To prolong our time underwater we began wearing short wet type shirts. The bottom at Cocos is tropical, coral growing everywhere. The usual brightly colored fish are about, and occasionally a school of tuna pass.

Ramsey Parks was to do a fish collection here for the University of California at Los Angeles, it would be the first from Cocos. To collect, a group of divers spread Rotenone, a fish poison, about an area. The fish soon suffocate and are easy to gather into boats. Two problems are involved: First, the fish that float have to be picked up before the birds get them, and Second, the dying fish attract sharks. Cocos has plenty of birds and more than enough sharks.

The next day Ramsey mixed the poison on deck in several large cans. It comes in powder form and must be mixed into a paste. The rest of us readied the diving equipment and cameras. Plazi Miller, our Captain, loaded a shotgun to scare off the birds, then started off in the small skiff toward the poisoning area. The rest of us left the Chiriqui in the large diving launch. Soon the launch was anchored, and the divers entered the water.

Ramsey, Lowell, and Jack Russel descended from the surface, each carrying a five gallon can of poison, the chem-

Capt. Miller follows the tradition of all ships to the Cocos by etching the name of the Chiriqui on a rock.



ical pouring forth a grey cloud from the open cans. Once on the bottom, the three divers spread the contents of the cans about the coral. The fish swam spasmodically, some ending belly up, floating, others lying about the bottom. From the surface, Plazi saw many large sharks milling about the edge of the area, but none of us underwater saw any large sharks. Many of the small white tips in the area became intoxicated with the poison, swimming wildly through the now turbid water. The collectors, working with four to five feet visibility, were startled occasionally by bumping head on into a four foot shark. After several hours in the water, we climbed wearily into the launch, happy with the collection, and even more pleased with the absence of large sharks.



The divers spread rotenone on different sections of the coral reef at Cocos to collect specimens for U.C.L.A. The small sharks were effected by the poison, but not the larger sharks.

During our stay at Cocos we were ashore many times, looking at the remains of treasure seeking operations. I think more money was spent looking for the treasure than was regained. Old mining cars and huge excavations are evidence of millions of dollars in equipment and labor. We poked about the streams and beaches, but found no treasure. On the stones along one stream are carved the names of the many boats that have called on the Island. Some names, probably whalers, are dated as early as 1813, seven years before the vast treasure was cached there. Finally we found our treasure. One day while searching underwater in the Bay, we found a fifty pound Danforth anchor. That, the film, and experiences were our treasures of Cocos.

On our last day there a peculiar incident occurred. Early in the morning a light rain was falling when we went on deck. Between the Chiriqui and the beach a huge rainbow had formed, the base of which was touching a certain place on the beach. That certain place just happened to be where the most extensive treasure digging operations had taken place. Did they get the treasure, or was it still there? Maybe there really was a pot of gold at the end of that rainbow.

The diving launch was lifted on deck later that day, and filled with coconuts for the trip through the Humbolt Current. Still later all gear was stowed or tied down and up came the hook, dripping its last taste of the Cocos sand. We rounded the Island at dusk into a heavy sea, the fantastic waterfalls and dense green colors of Cocos fading with the sunset. Ahead was the Galapagos Islands, the strangest formation of islands in the world.

Next month—The Galapagos

"aqua-lung"



AQUA-MASTER

U. S. DIVERS COMPANY

11201 West Pico Blvd.
Los Angeles 64, California

HISTORY OF THE COMPANY

1943—Captain J. Y. Cousteau and Emile Gagnan invent in France the fully automatic compressed air "Aqua-Lung", opening a new era of undersea exploration. The first unit developed featured a two-stage regulator (DA) and a tank block with a safety reserve.

1946—The first "Aqua-Lungs" are marketed in Europe by La Spirotechnique who own the Cousteau-Gagnan patent. In addition to the DA, with the same design still used in 1958, it features a two-opening tank, with a reserve valve at the bottom part of the tank.

1947—The first experimental deep dives to 300 ft. were made with the "Aqua-Lung".

1949—The first "Aqua-Lungs" were sold in the U.S.A. In 1952 the "Aqua-Lung" was first manufactured in the U.S.A.

1951—Cousteau and Gagnan developed the first one-hose unit with second stage in the mouthpiece and the first stage located at the tank valve. This unit was marketed in 1957 under the name "Aqua-Matic".

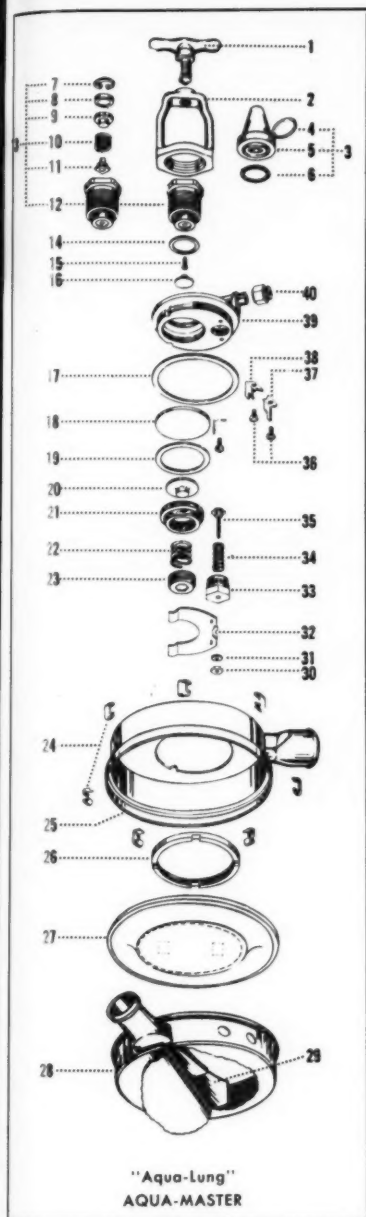
1955—The masterpiece, "The Silent World" was photographed by Captain Cousteau using "Aqua-Lung" diving equipment. Since the first DA regulator, the family increased substantially. One of the most important improvements to the line was the adoption of the Venturi action, first on the one stage DX (Venturi action in the mouthpiece) then on the DW or DY (Venturi in the box) and now on the one stage Mistral where a new type of orifice has tremendously improved the characteristics of the unit especially at

great depths. The Venturi effect is now used on the Aqua-Master, our new two stage unit! The U.S. Navy has used the "Aqua-Lung" for many years, and the new units are now being used almost exclusively by the Navy diving units.

The new Aqua-Master also incorporates a special Hookah attachment for diving with surface supplied air.

Officers of the company—U. S. Divers was initially owned by Rene Bussor who started it and exploited the "Aqua-Lung" products. At the beginning of 1957 the French company, La Spirotechnique who created the "Aqua-Lung", bought U. S. Divers. Now Captain Cousteau is chairman of the board of the company, Mel Burns is President and Francois Vilarem, who has been employed by La Spirotechnique for many years, is executive V.P. Harry Rice is Sales Manager. The research work is done in Los Angeles in connection with La Spirotechnique and Captain Cousteau's "Calypso" and research operations in Marseille (OFRS). The research department in this country will be substantially increased within the near future.

U. S. Divers is especially interested in new development that will render diving easier and safer for sportsmen as well as for professionals—all the phases of diving are being studied: breathing (compressed air as well as mixed gas apparatus), vision, protection against cold, inter-communication devices, propulsion, etc. At the OFRS in Marseille a new "diving saucer" is being completed and will be in use during the spring. This saucer will be a very handy device which will give man a new



ward and activates the horseshoe which opens the valve, thus delivering the air to you. When you cease to inhale the pressure builds up under the diaphragm until the time it ceases to activate the horseshoe lever.

The Aqua-Master is a two stage regulator. It means the pressure is reduced from the pressure in the tank (between 2250 psi and 0) to the pressure of the surrounding water. In the intermediate stage, the pressure is reduced to approximately 110 psi. The advantage of the two stage is that the effort to operate the regulator is constant. It does not vary with the pressure in the tank. In addition to that, you can use a strong spring in the first stage, thus decreasing the chances of a leak in case a small piece of dirt came to the seat itself (the dirt is washed by the strength of the spring). A two stage regulator is also more rugged.

The Aqua-Master automatically balances the pressure of the water. When you go deeper, you are delivered air at the exact pressure of the surrounding water. This is accomplished by the main diaphragm, which moves upward as long as the pressure on the air side of it is inferior to the pressure on the water side.

The Aqua-Master features a Venturi device which gives it a remarkable breathing characteristic. When the diver begins to breathe in, the flow of air creates a suction pressure which helps the diaphragm moving upward, thus taking a large share of the diver's breathing effort.

The Aqua-Master features a Hookah attachment for diving with surface supplied air. It can be used in three ways: attached to a tank, attached to a tank and at the same time connected to the surface supply through a hose or used as a Hookah without a tank block and connected to a surface supply through a hose.

Working under the basic Cousteau-Gagnan principles. The Aqua-Master features two hoses, one for inhaling, the other one for exhaling. The exhaling valve is so close to the diaphragm of the regulator that it never leaks regardless of the position of the diver.

DETAILS OF THE AQUA-MASTER FUNCTIONS

When the diver breathes in, he creates in the cavity under the diaphragm a suction pressure which makes it move upward (toward the body). Thus it activates the horseshoe 32 which opens the seat 35. The air begins to flow, the pressure in the intermediate stage goes down. The high pressure diaphragm 18 goes up, thus pushing the pin 15 through the pin support 16. The pin pushes the seat assembly 11. The high pressure compressed air, reduced while going through the high pressure nozzle 12 begins to flow into the intermediate

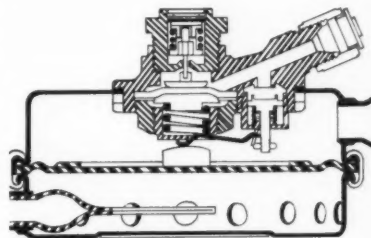
pressure cavity. When the diver ceases to breathe the pressure on the low pressure cavity builds up until the pressure of the air is equivalent to the pressure of the water on the other side of the diaphragm. At that time, the diaphragm comes back to its initial position. The horseshoe closes the low pressure opening. The pressure builds up in the intermediate stage. The high pressure diaphragm comes back to its initial position. The high pressure opening is closed.

The high pressure seat features a nylon insert pressed down on the nozzle by the spring.

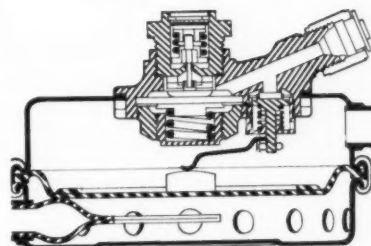
The intermediate pressure is settled at the surface at approximately 110 psi. The tension of the spring 22 on the high pressure diaphragm 18, determines the intermediate pressure. The adjusting screw 23 is used to settle it.

MAINTENANCE

We strongly recommend the diver follows carefully the following procedures:



Aqua-Master in Open Position



Aqua-Master in Closed Position

After a dive, rinse your regulator with fresh water once you have closed the high pressure opening with your finger.

Never let your regulator dry under the sun.

Never carry your regulator fastened to your tank.

From time to time check the condition of the exhaling valve: take off the clamp on the bottom box (with the holes). Air inlet, take off the corrugated hose. The valve can be reached easily. After checking replace it in the same position.

Have your regulator checked every year. For all servicing, read carefully "Diving with the Aqua-Lung".

tool to easily explore the depths down to 1500 feet. U. S. Divers has the belief that research work should have a more and more important place in the diving field. This is the basic condition of its growth.

The "Aqua-Lung" is an international product and is now manufactured all over the world—in the U.S. by U.S. Divers Co., in England by Siebe and Gorman, in Italy by Salvas, in Spain by Carbonell Gimeno, in France by La Spirotechnique. It will soon be manufactured in Japan and Germany.

PRINCIPLES OF THE AQUA-MASTER

The Aqua-Master is a demand type regulator. When you breathe in, you create under the diaphragm a suction pressure. The diaphragm moves up-

BREATHING APPARATUS OF YESTERDAY

This issue of the magazine is mainly concerned with the scuba regulators that are available to the skin diver of today, but perhaps we should also include a review of a few of the breathing apparatus designs that were used during diving's history. These different devices were primarily designed for self-contained underwater breathing, modern

engineering and improvements have perfected their original ideas into our present regulators.

One of the first designs made for pleasure diving was created by Commandant Le Prieur during the early days of underwater sport on the Mediterranean. "The Compleat Goggler" describes the Le Prieur apparatus as . . .



Le Prieur

Several descriptions of
underwater breathing gear
found in the U. S. Patent Office.

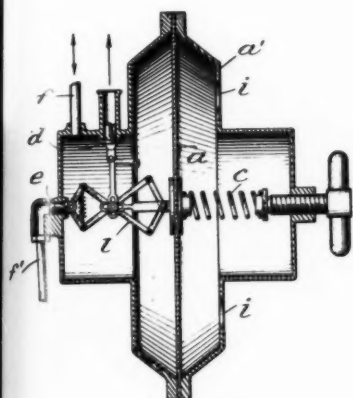
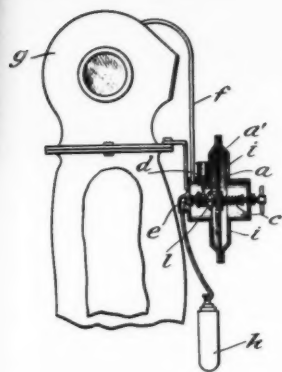
Patent drawings

courtesy of Dacor Corp.

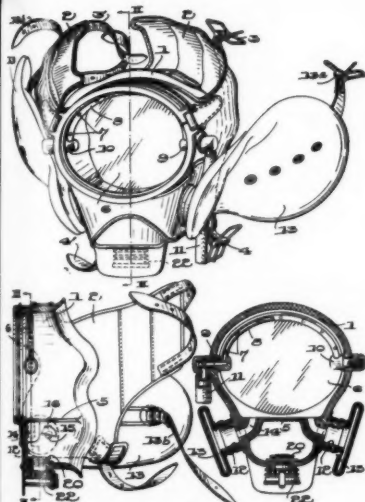
"The steel cylinder of compressed air is strapped to you by means of a parachute harness and is instantly detachable. You regulate your air supply with a handily-placed valve; the gauges on top of the bottle tell you just what you're using and how much air you have left." You will note in the photograph that this apparatus employed a full face mask and the cylinder was attached to the waist. Also noteworthy to mention is the .38 caliber underwater speargun being demonstrated by Le Prieur.

Another diving apparatus mentioned in "The Compleat Goggler" is the Maurice Fernex diving respirator invented around the year 1912. This respirator was designed for the free swimmer, however the air supply source was a pump or storage tank maintained on the surface. The stream of incoming air passed through the mouthpiece and out through the flapper valve, the diver could inhale whatever air was necessary.

Alexander B. Drager, of Lubeck, Germany, in 1913 applied for a patent on a diving apparatus to equalize the pressure in a diving suit. This was possibly the forerunner of our modern constant volume diving suit. The Drager device was to maintain pressure within the suit equal to the outside pressure at all depths. The equalization of pressure was accomplished by a diaphragm



A. B. DRAGER, 1913



KUMAKI ASARI, 1938

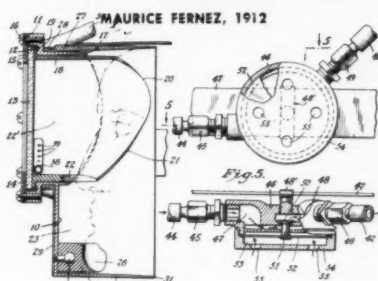
controlling a valve on a pressure supply line. The excess pressure was released through a second valve in close proximity to the diaphragm. The illustration shows the regulator placed right over the chest. This device eliminated two major dangers to the divers of that era; first, the pressurization of the suit pre-

vented the squeeze when the diver suddenly dropped to greater pressures (this squeeze and greater pressure would sometimes press the diver into the diving helmet); second, when quickly ascending the equalizing regulator would prevent the suit from ballooning and bursting at the seams.

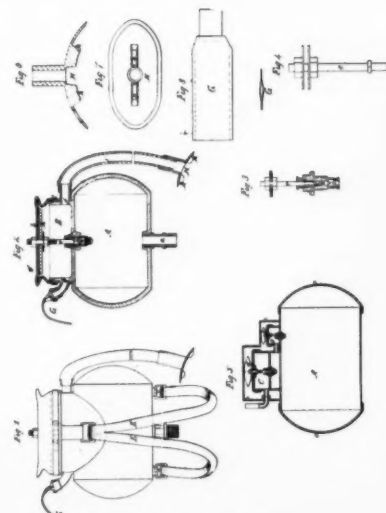
In 1938 a Japanese, Kumaki Asari, applied for a patent on his version of an improvement of the free-flowing mask. The Asari device consisted of a full face mask with the air being supplied from the surface. Air would enter the mask around the top portion of the glass plate and then into two pressure equalizing bags attached to the straps of the mask. When the bag and mask pressure was equalized with the outside pressure the air would pass into the breathing chamber through a valve where the air was inhaled through the mouth. Excess air and the exhalation would escape through a non-return valve located at the chin. With the Asari equalizing bags the diver was supposed to receive the correct amount of air in any position.

Victor Berge of Tahiti filed an interesting patent in 1941. This self-contained diving mask and apparatus was perhaps a little complicated as it consisted of an air supply tank that was carried on the back; a manual control valve so that the diver could change the air flow from the breathing supply to air bags or buoyancy control bags attached to the waist; the pressure equalizing diaphragm was attached at the waist (so that the delivered air would always be at a greater pressure than that pressure surrounding the head of the diver). From the diaphragm the air was passed to the face mask that was really a two-in-one apparatus. The mask was a hard rubber full face affair with an inner soft rubber mask. The soft rubber sealed against the face to prevent water or fumes from entering the breathing area and also to let the exhalation and excess air escape.

Most of the above years mentioned, 1912, 1913, 1938, 1941, are recent compared to this next one. In 1866 Benoist Rouquayrol of Paris, France received a patent on an automatic demand regulator that released air to the diver only as needed at a pressure identical to that of the surrounding water, irrespective of depth. Mr. Rouquayrol called his device "Diving Armor", and the entire unit was carried on the back of the diver. The compressed air tank delivered air to an air chamber by means of a valve. The valve was activated by a rubber cover on the air chamber, this cover (or diaphragm) moved the valve according to the outside pressures. Also described in the patent papers of Mr. Rouquayrol is a rubber flapper valve to release exhaled air and a mouthpiece exactly the same as we are using today.



VICTOR BERGE, 1941



BENOIST ROUQUAYROL, 1866



Voit

"50 FATHOM"

Regulator

W. J. VOIT RUBBER CORP.

2945 East 12th Street
Los Angeles 23, Calif.

THE 30 year old W. J. VOIT RUBBER CORP. of Los Angeles was already a well established sports equipment firm, as the world's largest producer of rubber-covered athletic balls, when skin diving began to "catch on" as a popular sport following World War II. The firm, founded and built by the Voit family, was purchased a few years ago by the American Machine and Foundry Company of New York, and now operates as a wholly owned, independent subsidiary of AMF, one of the world's acknowledged leading businesses. Voit's national distribution and reputation for quality products was built in the athletic equipment field primarily with its inflated balls, which are the standard for school play and the "best sellers" over the counter. With the resources of the \$200,000,000 AMF organization behind it, Voit has recently expanded into various other sports fields with wide lines of popular new products such as water skis and both vinyl and rubberized fabric air

mattresses, floats, wading pools, swim rings, and the like.

Voit's factory and home offices are located in Los Angeles. Branch offices and warehouses are maintained in Chicago and New York. A large sales force serves the entire United States, with representation in all principal cities. Hundreds of jobbers and thousands of retail outlets handle the Voit lines domestically, and foreign countries are served through an export agent.

Regarding skin diving, Voit was one of the pioneers of the "new sport." as an early distributor of the original Swim Fins brought to this country from Tahiti by Owen Churchill in the late 30's. Voit's early efforts were one of the major factors in the rapid growth of skin diving through its widespread distribution, making easy availability of diving accessories; through promotion and publicity on the sport; through sponsorship of diving competitions; encouragement of clubs and organizations; and the like. Voit was one of the original advertisers in Skin Diver magazine.

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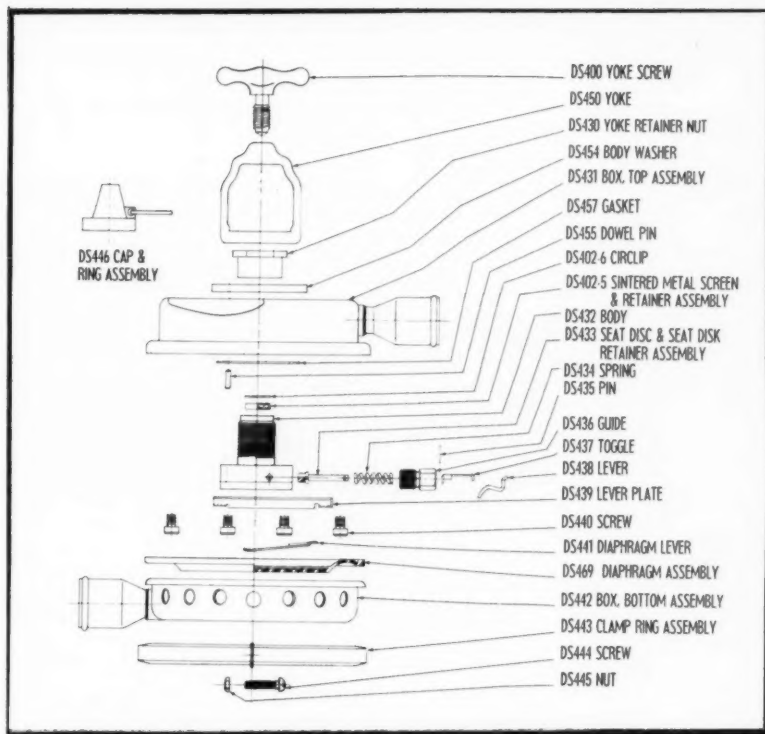
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While Owen Churchill Swim Fins and Masks formed the nucleus of the extensive skin diving line now offered by Voit, addition of new items and expansion of the line was rapid as the sport grew. Voit first added variations of its fins and masks, then snorkels, then guns and so on, until the line grew to include hundreds of items. In 1955, when Voit was sure it had the right products, Lungs and scuba accessories were marketed. Sales-wise and in popular acceptance, Voit has been one of the leaders in swimming and diving equipment, offering the right equipment for any age group and skill, at a variety of prices, from adjustable, inexpensive gear for youngsters and beginners to the finest professional equipment for the experts.

Voit's Engineering and Development Department, one of the largest and best staffed in the sporting equipment industry, is constantly experimenting to develop new products to fill existing needs, and to improve existing products to do a better job. After several years of experience with fine single stage and two stage regulators of the double hose type, plus an excellent single hose type regulator, Voit has developed and offers for the first time this year a new "50 Fathom" Regulator, described on these pages. Proved in pressure chambers down to 600 feet, and in actual use by a number of the country's leading divers, the new regulator checks out as an easy breathing regulator and simple to operate through minimum working parts, making it also easy to maintain. Finished in blue, with pearl gray hoses, it is also offered as the best appearing regulator. Along with it, Voit is also offering a "Safety Tank," first galvanized, then painted blue with white ends for safety through best visibility underwater, along with attractive appearance as a companion piece for the "50 Fathom" Regulator.

PRINCIPLES OF "50 FATHOM" OPERATION

Voit's new "50 Fathom" Regulator is of traditional double hose style, regulator behind the diver at the tank valve, and with non-return valves built into the intake and exhaust hoses. It is a single stage unit, with one high pressure valve to reduce tank pressure to breathing pressure, but it utilizes the Venturi principle, not in the hoses but within the body of the regulator. In addition to the usual air-flow channel, there is a very fine second air hole. This design provides a compensating principle to make the air flow easier at any external pressure—compensates to provide easy breathing at all depths. The same reliable, constant easy breathing normally associated with a two stage regulator is thus achieved in Voit's single stage unit.

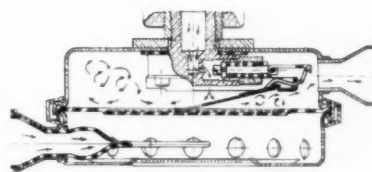


DETAILS OF REGULATOR FUNCTION

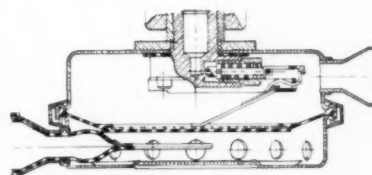
When the diver inhales, it creates a suction pressure in the cavity of the regulator which activates the diaphragm. This activates the straight lever, which in turn activates the second, curved lever. This second lever then activates the toggle, which pulls away the seat disk assembly from its seat in the body of the regulator. This opens the holes in the body, allowing air to flow to the intake hoses and into the diver's lungs. One hole in the regulator body is a very tiny hole with its axis in the direction of the box outlet. This creates a jet effect, utilizing the Venturi principle and making breathing considerably easier than if there were just one hole and one air channel. This size, location and combination of holes in the regulator body are, of course, engineered to compensate and moderate the flow of air and to establish it at the amount and pressure for the required level. With only a half-dozen moving parts, Voit's new regulator is one of the simplest regulating mechanisms yet developed, the minimum parts designed for surest performance and easiest maintenance.

SERVICE AND MAINTENANCE

Voit's regulators are factory inspected and adjusted for years of service without corrective service if they are handled properly and if preventive maintenance is practiced, such as washing with clean fresh water after use, keeping out sand, correct storage between use, etc. Should



Inhalation Position



Exhalation Position

service became necessary it can be provided at Voit's main factory in Los Angeles or at the Chicago and New York branches, through any authorized Voit dealer. "Do it yourself" service is not recommended, but the new unit is simple, with one screw adjustment to regulate ease of breathing. A screwed-on clamp ring assembly provides easy access to the interior working parts. Experienced regulator operators, such as diving shops with repair set-ups, can easily analyze the simple, logical design and working principles and make on-the-spot adjustments where replacement parts are not required.

New scuba regulators, reserve supply valves, and depth gages provided by the University or to be used on University projects shall be inspected by a qualified and designated mechanic prior to use.

Scuba regulators shall be inspected periodically by a qualified and designated mechanic at intervals of approximately six months.

All compressed air tanks shall bear a test date and shall be tested in accordance with Interstate Commerce Commission regulations. Before first use of any tank for diving, it shall be examined by a qualified and designated mechanic. Air tank harness, weight belts and tanks shall be examined for faults by the diver and his partner prior to each day's diving. If any abnormalities or malfunctions are observed, the defective gear shall be submitted to an authorized mechanic for repair or replacement before further use.

All air tank harness and weight belts shall have quick release devices designed to permit jettisoning the entire gear. The quick release device must operate easily with one hand.

Water-lubricated compressors are preferred for charging diving air flasks and should be installed in preference to other types at each University-controlled installation. All University-controlled apparatus, used for compressing divers' air, shall conform with the following: (a) The air intake shall be well screened and located to insure a supply of clean air free from contamination by fumes, smoke, etc. (b) The discharged compressed air shall be passed to a compressed air holder through frequently cleaned and recharged filters designed to remove dust and droplets of oil and water and to minimize other contaminants.

The following additional requirements apply to compressors which may produce carbon monoxide or other toxic materials (e.g. oil-lubricated compressors): (a) Oil-lubricated compressor cylinders and coolers shall be well ventilated or otherwise cooled, or the operation cycled to insure against high temperatures where CO is formed from the oil. (b) An alarm or compressor-motor-stop-control actuated by a temperature sensing device fitted to the high pressure compressor cylinder shall be provided and maintained in operation. The purpose of this provision is to minimize the formation of CO and CO₂ at all times. The temperature setting of the alarm or stop control shall be checked periodically by correlating normal operating temperatures with contaminant production evidenced on analysis of the compressed air.

REGULATIONS for SCUBA EQUIPMENT and BREATHING AIR

Furnished by the
University of California,
Institute of Marine Resources

Breathing air for scuba purposes is defined as air which meets the following specifications:

Minimum oxygen	Atmospheric air
Maximum carbon monoxide (for decompression dives*)	0.001%
Maximum carbon monoxide (for non-decompression dives**)	0.002%
Maximum carbon dioxide	0.030%
Freedom from dust and droplets of oil and water	
Absence of odors and vapors	

* Maximum carbon monoxide content of 10 ppm is specified for decompression dives, as defined by the 1956 U. S. Navy Diving Tables, because it is felt that such dives are sufficiently hazardous without adding the possible danger from the effects of high carbon monoxide concentration.

** In the absence of physiological measurements of the effects of CO under conditions of high environmental pressures, the value of 20 ppm has been accepted from the available knowledge in the literature and diving experience. Clinical information is very meager, and therefore, it is suggested that the concentration should be kept as low as possible.

Compressed ambient air at Scripps Institution of Oceanography or similar air pollution free locations will be considered to meet the oxygen and CO₂ requirements without testing. Oxygen and CO₂ may be determined volumetrically with a gas analysis apparatus. The

iodine pentoxide method shall be the standard method for making the analysis for carbon monoxide. Analyses for carbon monoxide by infrared spectrophotometry in place of the standard test (iodine pentoxide) will be acceptable for routine air tests subject to periodic calibration of the equipment by the standard method.

NBS colorimetric tubes may also be used for determining CO acceptability of air under a modified testing procedure as follows:

- Obtain a bottle of compressed air, containing carbon monoxide at a known concentration between 9 and 11 parts per million.
- With the NBS colorimetric equipment, sample the air to be breathed by taking 3 squeezes of the bulb. If a color change appears in the tube, the air must be discarded and not used. If the air is to be used for decompression dives, take 5 squeezes of the bulb. If a color change appears in the tube, the air must be discarded and not used.
- If no color change appears under (b), sample the calibrated supply through the same tube by taking 5 squeezes of the bulb. If color change then appears with the calibrated supply, the breathing air is safe and may be used.
- If no color change appears when sampling the calibrated supply, the tube is faulty and should be discarded. Using a new tube, repeat the tests starting with (b). Absence of visible dust, oil or water on a Whatman No. 40 filter paper after passing at least five liters of air through it will be considered satisfactory compliance for this specification.

Odors may be determined by sense of smell. ➤

New Products



SPORTSWAYS WATERLUNG—Has been engineered for the divers safety and comfort from all corrosion resistant materials. Features: Nylon manual control regulator clearing button; Neoprene impregnated nylon main diaphragm; Sintered bronze filter; Stainless steel intermediate pressure safety valve body and valve assembly—also a connection to install the Sea-Vue pressure gauge in the first stage of the regulator. Prices—\$59.95 for regulator, with Sea-Vue pressure gauge \$79.95; Complete unit, Regulator, Sea-Vue Gauge, tank and harness \$137.50. Available at your local sporting goods store. For illustrated brochure write, Sportsways, Inc., 6050 West Jefferson Blvd., Los Angeles 16, California.



FOAM-TITE—Especially designed adhesive for assembling or repairing foam neoprene wet suits. FOAM-TITE can be used on material when wet or dry. Surfaces can be bonded together by merely applying adhesive to both edges of material, let adhesive become tacky, then join together. Price \$1.00 (4 oz. size) Don Locke—1010 Thoreau Ct., Modesto, Calif. "Dealer Inquiries Invited"



"VIKING" REGULATOR AND ACCESSORIES—A unique two-stage regulator featuring a positive built-in reserve mechanism which gives two unmistakable warnings and which employs a simple lever to activate both the "Reserve" and a hose and mouthpiece "Flush". An air tap and the "Viking Safety Tube" allows two to breathe simultaneously through the regulator in an emergency. The tap also provides a means of dry suit to constant volume suit conversion, or camera case pressurization. The "Viking Pakboard" offers new comfort; quick change from single to double tank mounting; and instantaneous release. The "Viking" Tank has a 75 cu. ft. capacity; is neutral-buoyant and resin coated. Regulator \$89.80. Pakboard \$16.95. Tank \$48.00. Mfgd. and distributed by Christensen Tool & Engineering, Inc., Norwalk, Conn.

SKIN DIVER—February 1959



THE NEW AERO BOOTS AND GLOVES—Built and reinforced for long, soft, wear, better than perfect fitting shoes. Exclusive reinforcement adds to the comfort, and insures long wear. The Boots are made in 3/16" or 1/4" neoprene cellular material. This material plus the custom fit with a left and right boot, keep the diver warm in coldest water temperatures. Corrosion-proof emboss-mounted zippers make putting on and off easy. For further information refer to The Aero and Physicians Gas Co., 3171 Main St., Hartford, Conn.



PENETRATOR SPEAR GUN—The finest in spearfishing guns. Developed with a new hydraulic accumulator propulsion system which is built into the gun. No springs, no rubber bands, no cartridges. Most powerful and accurate. Power source lasts indefinitely. Compact, lightweight and uncomplicated with clean lines. Gun material and construction practically eliminates maintenance and repair. \$59.95 from your dealer or write: MAR-MAC INC., P.O. Box 3066, Hayward, California.



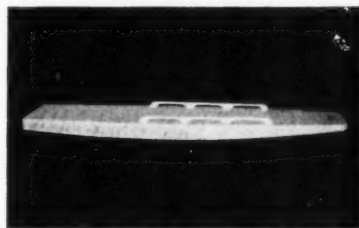
SKIN DIVER'S KNIFE—Sabre ground two edged high carbon stainless steel. One side of the blade has a wavy edge. Blade silver etched with picture of diver. Heavy molded red rubber handle with variegations for easy-grip. Molded sheath of light weight green plastic. The end of the sheath goes over the butt to hold the knife in the sheath. Price \$8.00 from: Bradford's, Box 157, Bay Head, New Jersey.



PERSONALIZED DIVERS FLAG EMBLEM—A 3" x 3" patch for jacket or trunks. This color fast emblem has your first name embroidered across the face of the Divers Flag. Here is an ideal way to be identified as one of the diving fraternity and at the same time promote safety. Price—\$1.00 from, Ski N' Dive, 14610 Lakewood Blvd., Paramount, California.



KAYE YACHT PONTOON BOAT—With fun space for 12 to 18 people on this flat deck, "Kayot" has all the attractive aspects of a backyard patio on pontoons. It's a complete family playground afloat. You can skin dive, fish, play cards, picnic—even barbecue while cruising. For further information write: Kaye Yacht Pontoon Boat Co., Mankato, Minn.



SURF-BOARD FOR SKIN DIVERS—This board is unusual in that it has convenient side handles enabling a diver to either rest or attach extra equipment. The Kustom Kraft Surf has unusual buoyancy, with a total load capacity of 400 pounds, and more stability because it is 24" wide at the widest point, 8' long and 4 1/2" thick at the after-end. Although the Kustom Kraft Surf is unusually sturdy and ruggedly constructed, it weighs only 37 pounds—easy to carry, easy to handle. The Kustom Kraft "Skin Divers" Surf-Board is attractively finished in multi-color speckle paint, with a durable water-proof plastic coating. Available in speckle white, speckle yellow, and speckle red. Priced at only \$39.95. Washington residents add 3-1/3% sales tax. Manufactured by Kustom Kraft Products Company, 260 Olympic National Building, Seattle, Washington.



DACOR DIVING LUNG

DACOR CORPORATION

P. O. Box 551

Evanston, Ill.

THE idea of going into the under-water breathing unit business was first conceived in 1949 by S. M. Davison, Jr. Engineering started shortly thereafter and the result was the Dacor Diving Lung. First prototypes, test models and the first production run were of the Venturi type. Production was changed due to the easy breathing the double diaphragm construction offered. The first object of the design was safety, performance and a device that was entirely different from anything ever developed. Once the double diaphragm construction was designed, no effort was spared in the testing. The final test models were used every day and then kept in a Freezer during the night. During the day light hours in the summer, the regulators were left out in the sun to bake, when they were not in use. They were also taken into a "Cold Room" and used in temperatures down to 83 degrees below zero. Actual dives were made to 237 feet in Green Lake, Wisconsin and to 300 feet in the ocean. Test models were subjected to 550 feet in a pressure chamber, on mechanical breathing equipment. Regulators were sent to both the East and West coast for extended use in salt water.

A breathing machine was made and regulators were run almost continuously for many weeks. The regulator is made of Naval Brass and stainless steel. Brass parts are first copper plated, nickel plated and then chrome plated. Rubber parts are neoprene and Ozone resistant rubber to withstand sun, salt and ozone. The regulator is assembled by highly trained persons, who are all divers themselves.

The regulator is produced by the "Sub Assembly" system. After all the component parts are made and run through a 100% inspection, they are assembled into "Sub Assemblies" (two to ten parts making one Sub Assembly). These sub assemblies are then inspected, tested and all put together into the final assembly. The unit is checked all along the production line and the final test is submerging the entire regulator under pressure in water. Microscopes, "U" tubes and special gauges are used in all testing and checking.

PRINCIPLES OF DACOR OPERATION

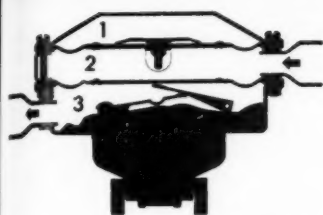
The Dacor is a two stage regulator and as such, reduces tank pressure twice. Once from 2150 p.s.i. (full tank) down to approximately 100 p.s.i. and then

down to another step for the diver's breathing. When the regulator is placed on a tank valve and the valve turned on, air rushes into the primary valve body and around the high pressure seat #2. As the high pressure air enters the primary reduction chamber body #11, it depresses the pressure regulator diaphragm #12, which in turn, depresses the pressure regulator spring #17. The pressure regulator spring #17 is set to permit approximately 100 p.s.i. to enter the reduction chamber body. When this happens, the diaphragm center bolt #13 is pushed away from the primary valve push rod #10 and the primary valve spring, with the help of the incoming air, presses the high pressure seat #2 against the opening. The diver is then ready for his first inhalation. As the diver inhales through the mouthpiece and the intake hose, he decreases the pressure in the intake chamber, which permits the intake diaphragm to be lowered. As this diaphragm is lowered, it depresses the demand valve lever #20, which in turn depresses the demand valve assembly #22. As the demand valve assembly #22 is raised from the low pressure valve port screw #21, the air that is in the reduction chamber body #11 is passed up this port screw and into the intake chamber and into the diver's lungs. When the diver stops his inhalation, the incoming air in the intake chamber raises the intake diaphragm and permits the demand valve assembly #22 to close off the port screw #21. This permits air to build up in the reduction chamber body, which depresses the pressure regulator spring #17. Since the diaphragm center bolt is not pressing on the push rod #10, the high pressure seat can then close and wait for the next inhalation.

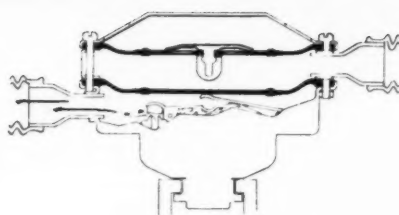
DETAILS OF DACOR FUNCTIONS

With the Dacor Regulator there are three separate places where pressures are involved and which have to do with the operation of the unit and the functioning of its parts. The location of these pressures, shown by the diagram are: 1. surrounding water; 2. Exhaust chamber; 3. Intake chamber.

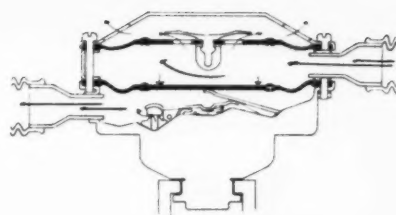
One diaphragm is located on each side of the exhaust chamber (#2). The upper diaphragm is the exhaust diaphragm and the lower one is the intake diaphragm. The exhaust valve is on top and in the center of the exhaust diaphragm and is locked through the exhaust diaphragm and plates. The exhaust valve opens upward during exhalation. Under the center of the intake diaphragm, a short distance below the lower plate, is the top of the valve operating lever. When the diaphragm moves downward, it presses on this lever and opens the air valve permitting



Three Pressure Areas



Inhalation Position



Exhalation Position

air to enter the intake chamber. In explaining the breathing cycle it may be best explained to start with the diaphragms in their normal or neutral positions in which all valves are closed and the pressures are equalized in the intake and exhaust chambers with the water pressure. When the user starts to inhale the air in the mouthpiece and breather hose, the pressure in the intake chamber (#3) is reduced, causing the intake diaphragm to be lowered

sufficiently to press on the demand valve lever and permit air to enter the intake chamber for the user. The air in the exhaust chamber (#2) may be just slightly compressed at this moment, which is the time when the user starts to exhale. At this same moment of exhalation, the exhaust valve opens and allows the exhaled air to escape through the water. The exhaust valve closes immediately after exhalation stops.

The pressure on the intake diaphragm from the air in the intake chamber, makes the exhalation effort much easier. As the exhalation is under way, the pressure in the exhaust chamber is built up, which lowers the intake diaphragm again and bears on the demand valve lever slightly. This action allows a small amount of air to enter the intake chamber and inhale hose, thereby making air immediately available at the mouthpiece when the user starts to inhale, which helps to make the unit easier breathing. Also, it helps to speed up the equalization of pressures in the inhale hose and intake chamber with the remainder of the unit. When the pressure is increased due to lower depths and if no breathing action is taken by the user, the greater pressure on the exhaust diaphragm (top) will depress it sufficiently to cause the U shaped push rod to lower the intake diaphragm and open the air valve for air to enter the intake chamber. Thus, even should the user forget to inhale, air will be supplied to his lungs and will cause involuntary action which will result in the user exhaling and initiating the breathing cycle. During the breathing cycle, exhalation is made easier by pressure building up in the intake chamber which causes the upward movement of the intake diaphragm at the same time exhalation starts and forcing the exhaled air out through the exhaust valve into the surrounding water. The continuous action of each diaphragm helps the other to perform its function.

The double diaphragm construction provides double protection to the user because the unit would continue to operate should either of the diaphragms become inoperative. For example, should the intake diaphragm (breather diaphragm) become damaged or leak air, the exhaust diaphragm would then function both as breather diaphragm and exhaust diaphragm. In this condi-

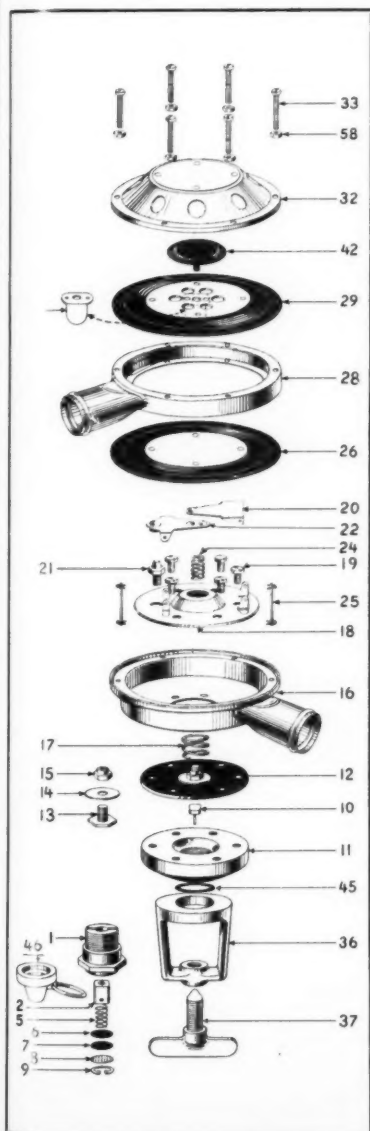
tion, the U shaped push rod and exhaust diaphragm would be depressed from the surrounding water pressure to the point where the push rod would bear on the valve lever to provide air to the user as needed. A harder breathing action would result, but the unit would continue to operate safely.

If the exhaust diaphragm should become damaged or leak, the unit would also continue to operate. In this case, the intake diaphragm would continue to operate, but would be subjected to the pressure of the water and the exhale valve (non return valve in the mouthpiece) would function as the exhaust valve. In this operating condition, the intake diaphragm would be operating against the water pressure, as in single diaphragm regulators. Since it is inconceivable that both diaphragms could be damaged or become inoperative at the same time, the Dacor Diving Lung, with its double diaphragm, could be considered many times safer.

The non return mouthpiece which prevents water from entering the intake hose, is of unique design and incorporates some very useful and important features. The wide bite lugs make it easier to hold the mouthpiece securely and reduces muscle fatigue. The valve chamber of the mouthpiece is set below center to eliminate interference with the face mask and to serve as a water or saliva trap.

SERVICE & MAINTENANCE

1. Remove regulator from tank after each use and replace dust cap.
2. Before removing regulator from tank, be sure cylinder is turned off and the remaining air drawn from the regulator through the mouthpiece.
3. Flush the mouthpiece and exhale hose after each use in salt water by pouring fresh warm water into mouthpiece. Occasionally remove intake hose only at regulator and flush. After flushing, hold regulator down and blow out through mouthpiece to clear water.
4. Never lift the tank by the regulator.
5. Never use more than finger pressure to secure the regulator to the tank valve. If a leak should occur at this point, check to see if the washer in the tank valve is in good condition. If not, replace.
6. Breathe several times from mouthpiece to check operation before entering water.



DRIFTWOOD



Please address all notes, letters and stuff to:

"DRIFTWOOD"
Skin Diver Magazine
Lynwood, California

... As you characters may or may not know, I put the contents of these pages together in manuscript (along with my gentle, perceptive observations), each month, working roughly thirty-days ahead of the issue in which your audacious outcries appear. I try for a reasonably current mood, avoiding mention of the weather, unusual news breaks and similar material since I am not (don't be disappointed now) a prophet and cannot tell, in January, what is likely to be happening, in February. I wrote these charmingly honest lines around the last few days of December '58. Last month's pages were whittled out the latter part of November. Confusing as all hell, ain't it? Well, that's publishing for you. I'm having the goodness to confuse you like this because I want to explain why my thanks arrives so late for all the fine cards I received, all of them either wishing me speedy recovery, a happy holidays or both. Some of those cards were masterpieces: all were truly appreciated. If you think I'm gonna break down and bawl—you're nuts. And if you want to know what has made me so hardhearted, indulge yourselves in the following . . .

Hey, Mutton Head . . . you ask for mail, so I write. You ask for photos, so I send one. If you don't want to publish them—okay, okay; but just where the hell are your manners? Why don't you, at least, acknowledge receipt? Your column stinks. Am still reading it. Must be nuts.

BILL CATTLE
Lima, Peru

If you are the same guy who sent the photo of the 94-year old Indian grandma wearing a facemask, flippers and what vaguely resembled a G-string, I thought I was doing you a favor by keeping my mouth shut. How long HAVE you been down there in the jungle, anyway?



Ted Nixon, a well-known diver in Michigan and across the country, would like to remind all Driftwooders to use the Divers Flag. Ted is one of the promoters of the Divers Flag and asks that you help publicize the Flag to all boaters, fishermen and water skiers. The Divers Flag is orange-red with a diagonal white stripe running from the upper left-hand corner to the lower right-hand corner. By attaching the Flag to your float you are advising all boaters and others that there is a diver in the water and that they should keep all boats under power at least 30 yards away.

I've just begun reading the DIVER, recently, and so I'm something of a Johnny-Come-Lately to *Driftwood*, but it appears that you are masterminding the only sanctuary left in these United States for male superiority. God bless you, sir. My wife thinks you should be deported while my mother-in-law believes you will be, eventually, captured and returned to whichever mental hospital from which you escaped. Myself, I have a hunch nobody knows where you are hiding as you send out each monthly blast against deadly Togetherness on the beaches and under the water. Whatever the case, be assured, Kohler, I am rooting for your Cause—even if I must root rather silently. Survival and all that rot, you understand. Forgive me for signing a phony name, old man. And don't let the female forces divert you from your admirable efforts to keep one, last spot strictly for the men.

JOHN DOE
San Diego, California

Yeh, but it's awfully lonely down here at the barricades, all by myself.

Been reading *Driftwood* for some time now and really get a bang out of it. Big question is: What's the beef with the high IQ squares, stateside? So they don't like *Driftwood*? So they should, maybe, buy a copy of *Reader's Digest*?

BEAIRD, SMITH & BAUM
112th Fighter Squadron
United States Navy

That signature sounds like a seagoing law firm. Anyway, thanks for the suggestion, men.

I read your amusing little column and I think most of the active girl-divers will agree with me: you are so childishly funny it's absurd. Oh, I get the very obvious reason for the fat old controversy about keeping us girls on the beach. Without it, your column would probably be dull reading material indeed. You're on the wrong track, boy. None of us living dolls are going to be flattered by your constant whining for photos of us. We would be ten times as flattered if you would devote some of your flappy lip to the notion that we are an important faction on the modern diving scene. How about it, honey?

LOUISE ANDERSON
Chicago, Illinois

No, ma'm. That's how you wenches got the Vote. Now, on the other hand, if you're interested in going bare footed and raising a family . . .

I am here to represent the teenagers of this planet (that is, if Kohler still remembers what they are). We are just about fed-up with the way Old Man Kohler treats us. I figure, if we can spend our hard earned money subscribing to your magazine, you can at least show us some respect. I have spoken.

MICHAEL SAXON
Anderson, Indiana

Teenagers? "Hard earned money?" Har de har, har. You cats are, for the most part, the greatest little gaggle of connen ever spawned upon deserving parents. A good day's work would be the death of a lot of you.

I owe you an apology, Kohler. When *Driftwood* first appeared in the SKIN DIVER, I told my friends it might last a month or two before intelligent, public opinion would crush it into oblivion. Then, as the months went by and *Driftwood* began gathering popularity (like any other unhealthy vice), I told my friends that, sooner or later, the divers would awake to the unpleasant fact you were helping them to make utter fools of themselves. Well, I guess I was wrong, Kohler. *Driftwood* seems to be doing just great. None of your readers seem to mind making nauseous fools of themselves. And I suppose this depressed admission of mine will only bring another of your sarcastic "observations" upon my head. You and *Driftwood* are living proof that the public at large is quite willing to buy inferior reading material.

SANDRA MAE JONES
New York City, New York

Tell me, could that music in the background possibly be your friends, laughing their fool heads off at you?

I'm a Navy man on Okinawa and just received my copy of the November '58 DIVER. It comes by very slow boat! I think the mag is great. Your column is great. I agree with you on keeping women at home—but your cartoons have got to go!

FRANK CONSENTINO
Naha, Okinawa

Can you get them a berth on that slow boat?

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Don't misunderstand me, Kohler. *Driftwood* is peachy-keeno. I love it. But don't you think too many of the letter writers concentrate on your faults when they should be discussing matters pertaining to diving and spearfishing? Even a going argument on the mysteries of marine biology would be a change of pace. If anybody out there thinks I have something in this idea, how about coming back at me with a discussion topic of interest to all. One we can, all of us, kick around.

ARNOLD WEBBER
Austin, Texas

Wait'll I get on the sidelines, will you? As I said, all last year, this is your page—not my column.

Skin diving is a clean, healthy, interesting and beautiful sport. It should be enjoyed and taken seriously by all those interested in it, and by those who love nature and have a desire to explore the unknown. When you get those type of people who claim to be divers (though they aren't fooling anyone) and write-in, asking for photos and addresses of pretty (?) girls, then diving becomes indecent and, I may add, unsafe. Men are not thinking logically, safely and scientifically. Oh, but then, some of your mixed-up readers may add: "Why must everyone take diving so seriously? Can't we have a little fun?" Sure, diving is fun—but not when all it involves are love-sick halfwits who only think about guys and dolls. Leave that sort of stuff on land. Let's not contaminate our waters with it. There is more fun in latching onto a turtle than in making sarcastic remarks at a girl's photo. I'm not against a little joke, here and there, but you carry it too far. Don't think that diving just involves pretty girls in bathing suits. This is what your column appears to express. You can't clown about diving. It must be taken in a very interested and serious manner if it is going to be considered a respectable and safe sport to mankind. I'm telling you—it's a new sport: give it a chance, leave it alone and let it develop to the most which it deserves.

MISS JANICE SCHERER
Sleepy Hollow Skin Divers
Tarrytown, Old Sleepy
Hollow Road,
Pleasantville, New York

If you weren't, quite obviously, very young and very, very sincere—I would allow myself the luxury of being facetious with your rather narrow viewpoint on diving. Instead, I simply suggest you maintain the courage of your convictions and see what time and growth do to them, honeypot.

I do hope you are coming to the 1st Annual National Skin Divers Convention, to be held in Boston, February 21st-22nd. I know a lot of fellows who would like to pat you on the back, and some who would like to punch you in the nose. Me? I just want to see what you look like. As far as I'm concerned, you resemble the fellow who is always grinning at the Divers' Bulletin Board in the back of the SKIN DIVER. In case you do come, give me a call and I will be glad to dump you in the Boston Harbor with the tea.

DICK DOODY
Malden, Massachusetts

Aren't you assuming you're big enough for the job?

Travel

Adventure

... and career training
aboard the finest ships of
the world's mightiest



NAVY

McSplash



"The fish are tremendous, visibility is about a hundred-feet — and look out for that joker in the speedboat!"

I like everything about *Driftwood*, and I think you are absolutely the most wonderful guy who ever handled a column for any magazine, anywhere. Are you single, boy? I haven't been following *Driftwood* very long, but I sure will meet you, each month, on that imaginary jetty, honey. The thing is—can you arrange for the two of us to get away from the mob of morons who just don't appreciate you?

WENDI DORMER
Las Vegas, Nevada

Well, I'll see if my wife thinks anything of the idea and if I don't happen to show up . . .

Always get a chuckle out of your corner of the magazine, particularly in regard to your professed attitude towards womenfish. One thing about it—they can't talk down there. I was introduced to skin diving by a famous instrument-flight instructor, fellow name of Don Patrick from Cleveland, Ohio, when I was on a flying trip to Florida last winter. (You see, this legal dodge is just a front for the aviation bit.) I'm like you, though: for the sport of it, I like the free diving. Now, photography is another thing. Keep up the good work. You have hooked (or is it "speared"?) another reader.

FRANK KINGSTON SMITH
Attorney at Law
Philadelphia, Penn.

Welcome, counselor, welcome.

I've been watching the SKIN DIVER television show each week. I've noticed that most of their guests seem to be pretty well-known divers from this area and, since I hear you live in the area, I've wondered why they haven't had you on the show. Certainly, you would provide a change of pace. My boyfriend says he met you once and you're pretty outspoken, especially when it comes to talking about diving. Is there any chance of catching you on that show as a guest in the near future?

DOROTHY BAXTER
Los Angeles, California

Not as long as they keep insisting I go on-camera, bound and gagged. But, then, that's Hollywood for you.

... and there you have any number of explanations for my pitiless attitude toward untrammelled humanity with its snorkel jammed. My thanks to JAMES D. MALLOCK and the EGLIN AKWA KWAKS for letting me join the school, and I will, thenceforth, conduct myself in a manner befitting an EGLIN AKWA KWAK (which I suspect is mighty similar to the way I've been disporting myself, lo, these long, weary years) with eclat. If the rest of you characters will quietly meet me here, behind the rocks, next month, I promise to have the beach cleared of teenagers and the coffee pot bubbling. This is a date?

Carl Kohler

WATERLUNG

SPORTSWAYS, INC.

6050 W. Jefferson Blvd.

Los Angeles 16, California

SPORTSWAYS, INC., was formed in 1958 by Richard M. Kline who, since 1945, has been known throughout the sporting goods industry as a pioneer in all fields of sporting goods products including all types of underwater sports equipment.

In providing a home for Sportsways, Inc., a manufacturing plant was set up at 6050 West Jefferson Boulevard, Los Angeles 16, California. This plant includes a completely equipped experimental tool and machine shop with the finest tool makers, designers and engineers devoted exclusively to the design and development of new products for the diving field and the sporting goods industry.

While designing a new self-contained underwater breathing apparatus which was to be exclusively Sportsways', both Richard Kline and Samuel Lecocq, underwater research engineer and pioneer in scuba diving, decided not to manufacture a two hose type regulator but instead to move into the future and manufacture a Two Stage Single Hose unit. Waterlung is a completely new unit with features never before incorporated in any single demand regulator.

A year of engineering, prototype, development and finally the most rigid and relentless testing with a goal of perfection in view . . . as a result in the Waterlung there is a Depth-Compensated Automatic Air Reserve in the First Stage as well as an orifice directly in the First Stage for Sportsways Sea-Vue Pressure Reading Gauge. The Waterlung is available with or without the Sea-Vue High Pressure Reading Gauge.

Sportsways has named its scuba the Waterlung because this name is certainly synonymous with its use, a name easy to recognize and remember. The Waterlung is made of materials that have been scientifically selected for maximum corrosion resistance. The

unique design and construction of the Waterlung and the materials used make it a rugged, dependable unit.

FEATURES OF THE WATERLUNG REGULATOR

The Waterlung breathes easily in all positions and its exhaust system is so efficiently located that no air bubbles will obstruct the diver's vision at any time. Divers who work in fast flowing rivers or who enter the water through heavy surf will particularly appreciate the Waterlung's almost negligible drag and water resistance. This feature helps to conserve both air and energy.

The design of the First Stage incorporates an intermediate stainless steel safety valve which is pre-set in much the manner that safety valves should be incorporated into all high pressure systems. The relief valve assures the diver of another safety factor.

The Waterlung has a depth-compensated automatic air reserve that has been engineered into the first stage regulator itself. Regardless of depth it will always insure an adequate supply of air to enable the diver to reach the surface. In engineering the depth-compensated air reserve, it was our objective to eliminate the element of human error and mechanical malfunction. The air reserve is automatic.

The automatic air reserve functions in accordance with an infallible law of physics wherein a stream of air will flow through an orifice of a given size in direct proportion to the pressure of the air behind the orifice. As a result of this law the amount of reserve air in the tank will always be proportional to the outside water pressure and the requirements of the individual.

With the Waterlung regulator the pressure of the breathing air will be exactly the same as the pressure of the water around the body (ambient pressure). As a result, during the descent

the diver will always find it easy to equalize the pressure in the ears and sinuses.

The demand regulator is right at the mouthpiece which assures air supply delivery instantly without a lag in breathing response.

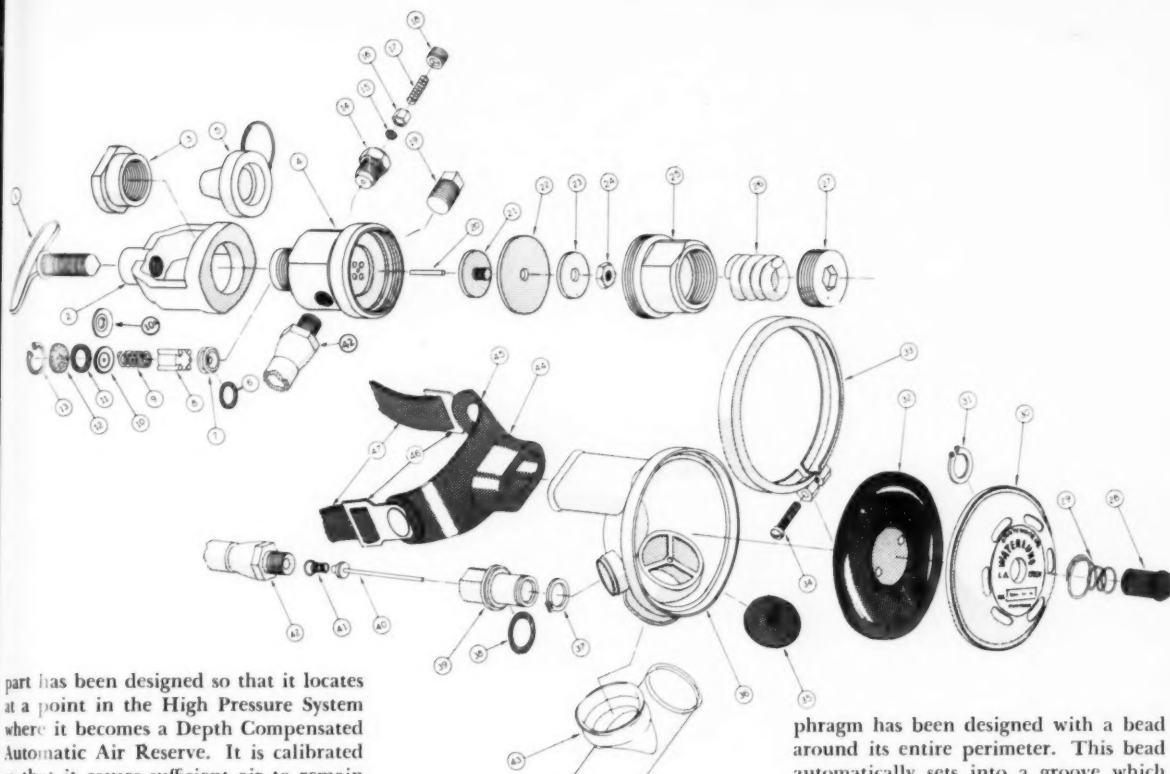
WATERLUNG FIRST STAGE

Fig. No. 4—Main Valve Housing high pressure block is made of Navy Brass triple chrome plated for maximum durability. It includes a special High Pressure Outlet Port which permits the use of a High Pressure Reading Gauge as an integral part of the Regulator itself.

Fig. No. 7—Stainless Steel Reversible Valve Seat is a separate component and is almost impervious to damage. It is reversible, with both sides being identical, which doubles its lifetime efficiency. If it should ever need to be replaced, it can be done in a few minutes and very inexpensively, thus reducing maintenance costs to a minimum.

Fig. No. 8—High Pressure Nylon Valve with Stainless Steel Insert. This Valve has proven extremely effective and trouble-free. The Stainless Steel Insert insures long and efficient service and the Nylon Valve literally seats itself with continued use. It can be replaced in a few moments if required.

Fig. No. 10—High Pressure Spring Guide and Flow Control Orifice. This



part has been designed so that it locates at a point in the High Pressure System where it becomes a Depth Compensated Automatic Air Reserve. It is calibrated so that it causes sufficient air to remain in the tank, regardless of depth, to insure the diver a supply of air at all times to enable him to ascend to the surface.

Fig. No. 10A performs the same function as Fig. No. 10, as a High Pressure Spring Guide and is included with each Waterlung packaged separately in a bag attached to the Yoke. It has a larger orifice than Fig. No. 10 and should be used only with a Spring Loaded Air Reserve (constant reserve).

Fig. No. 12—Sintered Bronze Filter which is especially electro-nickel plated for maximum corrosion resistance . . . maximum service.

Fig. No. 14—Stainless Steel Valve Body and Valve Assembly. This extremely important assembly has been scientifically designed so that it is literally indestructible and offers the maximum safety factor yet incorporated in an underwater breathing apparatus. The Valve Seat is an integral part of the Valve Body . . . thus incorporating in the Valve Body and Seat all of the superior performance qualities and durability of stainless steel.

Fig. No. 19— $\frac{1}{8}$ " Screw Plug is used in the High Pressure Gauge Outlet Port when the Waterlung is purchased. This can be removed to screw into the port, the Sea-View Pressure Gauge which can be purchased separately or any other standard pressure reading gauge of this type with $\frac{1}{8}$ " pipe thread.

Fig. No. 22—Neoprene Impregnated Nylon Fabric Intermediate Pressure

Diaphragm has never before been used in a pressure reducing valve and the amazing qualities of the material used make it literally indestructible.

WATERLUNG SECOND STAGE

The second stage is a completely new and original design. The entire second stage weighs but a few ounces and the balance of the unit is such that there is literally no sensation of weight, drag or discomfort on the mouth or face. An all important characteristic of the second stage is the location of the exhalation ports, which makes it virtually impossible to get bubbles in the face, regardless of the position of the body.

Fig. No. 28—Nylon Manual Control Regulator Clearing Button is a far-reaching innovation which eliminates the problem of clearing the regulator of water. This clearing button has a further important use in that by simply touching the button, a diver can under conditions of stress or strain get a direct flow of air with no effort.

A most important use for the Manual Control Button is where artificial respiration may be necessary, both underwater and on the surface.

Fig. No. 32—Main Diaphragm is made of nylon fabric impregnated with neoprene, making it literally impervious to deterioration and giving the diver a safety factor. The actual design of the diaphragm makes it possible for it to function with complete mechanical freedom. The outer edge of the dia-

phragm has been designed with a bead around its entire perimeter. This bead automatically sets into a groove which has been formed on the inside circumference of the lower half of the regulator case. The diver need have no concern about the diaphragm becoming unseated.

Another feature of the diaphragm is that stainless steel plates are used on both sides, riveted together permanently.

Fig. No. 39—Free Turning Valve Body is one of the reasons why the second stage is so comfortable in the mouth. The regulator valve body is set at exactly the proper angle which permits the entire second stage to remain in a comfortable position at all times.

Fig. No. 40—Valve and Stem Assembly is an integral part of the demand regulator valve system which has been designed so that there is only one moving part. The simplicity of design provides for replacement of this part within a few moments, should it ever be required.

Fig. No. 42—Flexible Nylon Hose Assembly with triple chrome brass couplings. This hose has a 400 p.s.i. working pressure and an 8 to 1 ratio safety factor, an excess of maximum aircraft standards.

Fig. No. 45—Neoprene Mouthpiece Strap has been designed and positioned so that by adjusting the neck strap the entire second stage and mouthpiece is firmly retained in place in the mouth. Under stress conditions and heavy currents the divers arms can be free at all times.

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It is with pride that the Northeast Council of Skin Diving Clubs, Inc., announce their sponsorship of the First National Convention of Skin Divers. By the associated effort of many member clubs this tremendous undertaking was proposed and accepted. The time . . . Feb. 21 and 22, 1959. The place . . . Hotel Bradford, Boston, Massachusetts.

As diving club and council delegations over the nation and Canada get set for the founding convention of divers in Boston, word comes that the "father of free diving", Captain Jacques-Yves Cousteau, has accepted an invitation to address the meeting. Captain Cousteau, who was recently named honorary president of the World Diving Federation, formed in Brussels, said he was "glad to have the opportunity to attend the first meeting of the American society and discuss our sport with American divers."

Delegates from clubs and councils throughout the nation have been registering at an increasing rate to have their say in the national organization. The convention is planned to strengthen club and council work and build a national underwater forum. Unaffiliated delegates will be welcome at the founding convention, but the national body will be the voice of organized divers, a service society for clubs and councils, carrying out programs they devise.

In addition to Captain Cousteau, national figures to be announced will participate in the founding convention. It will be covered by the nationwide press

and television. Club and council discussions beforehand indicate keen interest in forming national policy on spearfishing laws, underwater safety and diving instruction. Delegates are bringing to Boston resolutions on these and other problems, so that the united strength of the diving fraternity can be shaped up behind local and regional efforts.

Aside from urgent national business, the Boston convention will be the biggest diver's social event and exposition ever held. Public meetings, demonstrations, films, exhibitions, a banquet and dance are on the diving table for the big Boston plunge. The organizing committees, chaired by Richard Myers, requests delegations to bring club and council blazers, jackets and insignia. Also delegates should bring the flags of their organizations to be flown in the meeting halls. In the meantime, organizations and individuals not yet registered, are urged to send their reservations immediately.

Notes from the organizing committees: "First and foremost the absolute need for such a convention is almost a foregone conclusion. We all know from varied experiences in our sport the great need for unity. To place our strength before the entire country, our purposes and desires. To enable us the one Golden Opportunity to present skin diving in its true form to the public which many times in the past has been totally misunderstood."

"Let's not kid ourselves, we face a

crisis. With the closing of hundreds of miles of diving areas by un-informed authorities, and the needless waste of lives by un-affiliated divers, points to these factors, let's get together . . . skin divers alert . . . have a meeting . . . somebody do something before it is too late. Let's combine our efforts and do it together."

"The need for a national group of officers, that will unite every council and club in the country, is great. Without this national group, there is no real way that we can help each other, even though we feel and think the same about our sport. This is the opportunity that we have been waiting for, to show our government and the general public, that we, as divers, are organized nationally, to promote safety, sponsor activities or competition, test new and unapproved equipment offered to the public, give aid to any group desiring to organize skin diving organizations, to assist Government officials in any way possible relative to our sport, and to disseminate information relative to the sport of skin diving."

"We strive to afford you a two day convention, the likes of which may be duplicated in the future but never surpassed. We welcome you to take part and to share our joy and happiness in making this convention a successful and admirable contribution in behalf of skin diving the world over."

"We have reached into the great sport of skin diving to bring to Boston, all the wonderful personalities, so familiar to us all. It is our fond hope that all in attendance will have an equal opportunity to meet and speak to these guests. We have tried with all the means at our disposal to relay the vital information regarding the Convention to all points of the globe. Any service we may impart to make your stay one of enjoyment and lasting memory is our only desire."

"We are thoroughly prepared to solve all transportation problems that will arise in connection with the First Annual National Convention of Skin Divers."

"For your interest and enjoyment, a giant display of equipment and services will be offered by the manufacturers and distributors in the skin diving industry. This will be the greatest display for divers ever assembled under one roof. Numerous previews of things to come will be presented. No admission will be charged, and the doors will remain open throughout the convention."

"Everything within the power of this organization will be done to insure all visiting delegates a wonderful weekend. Fashion Shows, lectures, films etc., will be made available free of charge. A sincere effort by all has been made to make this First National Convention a tremendous success."

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Convention Committees



Ushering

Decorations

Historian

NATIONAL CONVENTION COMMITTEES

Program—Worcester Frogmen, Inc. Co-Chairman, Elman Myers and Corey Horne. Display Booth—Northeast Cine Divers. Co-Chairmen, Paul Hennessey and Robert Roth. Entertainment—South Shore Sea Serpents Co-Chairmen, William Hoyer and Russ Bishop. Public Relations and Invitations—Fairhaven Whalers Skin Diving Club. Co-Chairmen, Brad Luther, Jr. and Al Parhoco. Policing—Massachusetts Sea Lions. Co-Chairmen, Patrick Baldasaro and Eugene Dymski. Transportation—South Shore Neptunes. Co-Chairmen, Fred Calhoun and Robert Reynolds.

Refreshments—Middlesex Divers. Co-Chairmen, Paul Grant and Robert Sayre. Information, Registrations, and Credentials—Bay State Aqua Club. Co-Chairmen, Wayne Comeau and Gerald Comeau. Ushering—Lowell Underwater Explorers Club. Co-Chairmen, Raymond Cloutier and Andrew Cornellier. Decorations—Worcester County Spearfishermen. Co-Chairmen, Dennis Kerr and Ted Christensen. Historian—Framingham Sea Urchins. Co-Chairmen, Ray Lawrence and Glenn H. Ashman.

These committees have been very active in planning for your pleasure and comfort. Convention Committee meetings have been held. All committees have turned in their final favorable reports. The plans are now complete for the First Annual National Convention and we await your registration.

REGISTER NOW FOR THE FIRST ANNUAL
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\$3.50 for each additional person
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The registration fee per delegate is \$10. This fee includes your credentials, seating on convention floor, voting rights, banquet and dance tickets. The charge per guest is \$5, which includes the Banquet and Dance. Guests are not allowed on the Convention floor. No charge is required for guests if they do not wish to attend the Banquet and Dance. The \$10 registration fee DOES NOT include the rental of sleeping facilities.

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Regular Price	Size	Waist	Weight	Height
\$75.00	Small	28-34	130-155	5'3"-5'7"
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85.00	Large	34-38	170-205	5'9"-6'1"

First quality and brand new. This terrific low price made possible by CENTRAL's fantastic buying power. This is the answer to your underwater suit problem. Here is a "dry" suit that needs no underwear because it is also a "wet" suit. The seams are taped, reinforced and vulcanized. The cuffs are tight; the pants and shirt roll together; the attached hood is joined by the same strong rubber; pliable, yet extremely tough. The water cannot get in ("dry type") but can only seep in slowly ("wet type"). Sleeping in slowly, the small amount is easily warmed by the body. (No need for underwear.) This extremely durable 3/16" skin both sides foam rubber suit is imported from France. The full length pants have rubber suspenders. The long sleeved shirt has the hood attached. You also get boots, glue and "Rubber Dust". USED BY THE UNITED STATES, BRITISH, FRENCH AND ITALIAN NAVY FROGMEN. EXCELLENT FOR SALVAGE OR SKIN DIVERS.

Only factory irregulars left. Suits have slight imperfections which will not affect wear.

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Now with very little effort, you can custom build your own wet suit and save more than 50%. Central's fabulous multi-fit pattern enables you to make a suit that fits your every exact measurement. Also included in the kit are 2 large bottles of glue, pre-cut seam material, zippers and step by step instructions. The only kit that offers you shirt, pants, hood, AND gloves. A fantastic 5280 square inch of the first quality 400% stretch Neoprene.

Reg. \$32.50 1/8" Kit—NOW \$19.95

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Kit \$52.50 Value—SPECIAL \$28.95

Every kit comes complete and Central pays the freight

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Strongest stainless case ever made. Full one year guarantee. Needs no cleaning or oiling for three years, unbreakable mainspring, water-proof band, guaranteed to 600 ft. underwater, shock-protected, 17 jewel movement.

The **Sherpa** is luminous and self-winding with the face of a dress watch and rugged dependability of a top quality underwater watch. Nationally advertised price \$95, our price \$44.95 -10% Fed. Tax

Sherpa Diver—deluxe self-winding, featuring a movable bezel to record exact submerged time. Extra luminous face, band make it a striking dress or diving watch. Nationally advertised price \$99.50, our price \$59.95 -10% Fed. tax

Stainless steel expansion band for any watch. Reg. \$7.95 \$3.95 add.

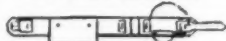
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Central brings you the famous type 40,000 candlepower light used on the Andrea Doria completely pressurized and guaranteed. Lowest price in the country. Only \$8.95.

Extra Batteries\$2.79
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Famous **Pescatore** duck and leather utility belt. Lined pocket for extra heads, hooks for flashlight, knife, etc. Professional fish stringer.

Was \$7.95.....NOW \$2.25

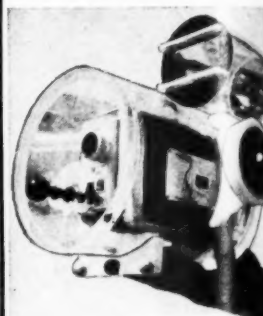
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World famous double tank-block with automatic positive reserve, 2 "80 minute" hot dipped galvanized tanks, and metal bands and harness. Nationally advertised with **Aqua-Matic** regulator for \$167.50; with famous make **Venturi** action double hose regulator for \$195.00.

Aqua-Matic Regulator and "160 Minute" double tank block with automatic reserve
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FAMOUS MAKE CAMERA & HOUSING



Central brings you this famous 8mm camera with F2.3 lens that lists for \$109.90. PLUS housing pressure tested to 75 ft. made of the finest 3/8" plexiglass. The colored housing is worth every penny original \$69.95 list. All controls are "O" ring sealed, complete with frame finder and large ring grip. Camera is easily removed for regular use. Reg. \$109.90 8mm Camera with Housing complete. \$69.95



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JAMAICA 32, L. I., N. Y. - RE. 9-5772
MINUTES FROM MANHATTAN

CALIFORNIA ABALONE BILL IS THREAT TO SPORT OF SKIN DIVING

By Dick Hardie

At the meeting of the Calif. Fish and Game Commission in Los Angeles on Jan. 2, 1959, the Dept. of Fish and Game launched a misguided missile aimed directly at the heart of every skin diver in the state. It was recommended by the Dept. that the taking of abalone be limited, north of Point Arguello, to those days during which there occurs a minus tide.

For those not in the know, a minus tide is one which is lower than the average low tide. This would limit diving for abalone to approximately ten days per month. That is if you could go diving any day you chose. If, like most, you

are limited to diving on week ends, there would be about ten days during the season when you could go abalone diving.

The Dept. will be the first to admit that there is no lack of abalone in the area effected by the proposal. In fact, in November the Dept. reported to the Assembly Interim Fish and Game Committee that the results of the Department's abalone survey which had consumed many years and many thousands of dollars was that the commercial take of abalone north of San Francisco would not effect the shore supply adversely.

Nothing was said about the effect of commercial diving on skin diving territory. It seems that skin divers were not even considered. Be assured that a commercial operation would take advantage

of the easy pickings in skin diving water. Then we divers might have to join the waders in order to find abalone.

Here it is. The punch line. The reason given for wanting to limit skin diving for abalone is to give the wader an "equal break." It is assumed that if this is accomplished we can expect a regulation to compel a good shot to file off the front sight of his rifle or break the objective lens of his "scope sight to give the poor shot an "equal break." You take it from there.

Now to the reasons and forces behind this blunder. Get your dramamine. It appears that two young divers from Ft. Bragg (Calif.) were hired by a third person to take some abalones. The culprits were apprehended and the judge, game warden and head of the local sportsmen's association brewed up a

Complete Skin Diving Headquarters

AL'S SPECIALS

SMASHES MARKET

can custom built in 50% Central you to make a cut from material step instructions, rt, pants, hood, ware in the of the rene.

—NOW \$10

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6" skin on bon

SPECIAL \$28.95

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"MAE WESTS"

Central SMASHES underwater life jacket prices

A brand new, never used guaranteed the finest quality latest model heavy duty light weight U.S. Government life jacket.

These were recently manufactured and cost the set over \$30 each. No commercial vest can even come close to this quality.

SKIN DIVERS, this vest when inflated with the power-pak cartridge (readily available) pulled a diver out of the water up to his knees from a 20 ft. Attention, LUNG DIVERS, this power pak while not used for rapid ascents for lung divers support TWO divers with full equipment at the release mechanism is very positive and cannot be pulled.

It can be inflated by mouth at or below the surface and worn open or in pouch. "MAE WEST" in a 5" nylon pouch complete with harness.

\$9.95

Club price 6 or more \$9 each.
Extra power pak cartridges \$1.50 each.



WATER DEPTH GAUGE

Liquid filled compass with Bourdon principle depth gauge. Extremely accurate, luminous, non-corrosive plated brass case with duty wrist band. Easy 1/2" increments. Central's

\$12.95

AQUAPHONE



Very clever sound powered underwater speaking device that can be placed in a mask or utilized with any regular mouth piece with the exception of the Northill. Good for limited conversation or attracting attention. Excellent for safety minded divers. Easily installed.

Now half price **\$1.99**

SKIN DIVING JEWELRY

delated silver or gold finished jewelry. Authentic reproduction many dollars more. Each item is individually gift boxed.

Aqua-Lung is an amazing reproduction of tank, regulator, harness, and the J valve pull rod. Available as cuff links, key fob, tie tack, or clip.

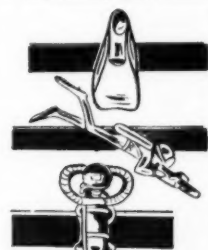
reproduction of the Cressi Rondine (valve) fin is also available in the styles.

With double tanks and torpedo camera is available as a tie bar or cuff link set only.

Tie bar and link sets.....\$1.95 each
Cuff links.....\$3.95 set
Fobs.....\$2.50 each
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Why pay more for same Jewelry?



CENTRAL'S SKIN DIVERS KNIFE



Central brings you "THE" Knife for Skin Divers. After extensive tests we have mfgd. "THE" knife, that makes all other diving knives obsolete.

BLADE—6 1/2" long, saber ground double edge stainless steel; High Carbon holds an edge, will not rust; Serrated edge for sawing action; One piece blade and handle, with hole on butt for cord. **HANDLE**—Heavy lifetime non-slip rubber; Permanently moulded to blade; Bright color for easy visibility. **SHEATH**—Light weight moulded plastic; Positive locking; Extra sturdy—fits up to 2" belt; Knife easily removed but cannot fall out; Average length almost 12".

Most professional divers work near the bottom, so we have not made this knife to float.

Value **\$9.95**

SPECIAL at Central ONLY.....

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UNDERWATER WATCH



Improved model of Healthways famous 100 fathom watch. Strongest stainless steel case ever made. Full 1 year guarantee. Improved Ultrasonic movement, ultra luminous dial and hands, unbreakable main-spring, waterproof band, rugged yet attractive. Guaranteed waterproof to 600 ft., shock proof—bayonet back. Mail Adv. price \$65.

Our price **\$26.95** plus 10% fed. tax. Stainless Steel Expansion Band.....**\$3.95**

POWER DIVER—SAVE \$100

Battery driven unit to conserve air supply & enable diver to cover large areas more rapidly. Extremely maneuverable to depth of 180 ft.

Was \$350.....Now **\$250**

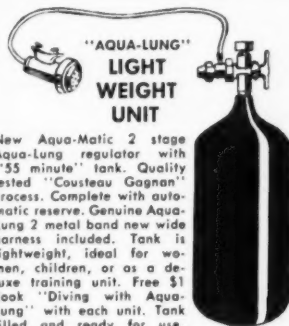
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Now Central brings you the world famous Weston Exposure meter complete with extra heavy lucite case. Ideal for still or movie camera. Pressure tested to 150 ft. Needs no underwater adjustments. Housing complete with Weston Meter with nylon and neoprene neck-strap at a 25% saving. Reg. \$39.95 Special **\$29.95**

NEW AUTO EMBLEM



3 1/2" diameter raised 3-D Metal Scuba Diver **\$1.95**



"AQUA-LUNG" LIGHT WEIGHT UNIT

New Aqua-Matic 2 stage Aqua-Lung regulator with "55 minute" tank. Quality tested "Cousteau Gagnan" process. Complete with automatic reserve. Genuine Aqua-Lung 2 metal band new wide harness included. Tank is lightweight, ideal for women, children, or as a deluxe training unit. Free \$1 Book "Diving with Aqua-Lung" with each unit. Tank filled and ready for use. We pay shipping. Reg. List \$82.50

CENTRAL SPECIAL.....**\$64.95**

Complete

ARBALETE SPECIALS

\$27.95 Deluxe as shown now.....**\$19.95**
\$19.95 Standard 2 elastic now.....**\$14.95**
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MINUTES FROM MANHATTAN

tempest and aimed it at all skin divers. They declared that skin divers were bums and must go. Words to this effect appeared in an article concerning the matter in the Ft. Bragg newspaper.

These are not the only misdeeds brought to the attention of Fish and Game officials. It seems that four skin divers and six abalone waders became involved in a free for all brawl when the former were accused of encroaching on the latter's territory. How does one dive in waders' territory? Whose territory is it? Need these questions arise between real sportsmen? In any event, the incident was reported to the Dept.

Surprisingly enough, much regulation and legislation stems from just such petty bickering and jealousy. It can and is happening to us skin divers. Another unpleasant facet of this situation is the

possibility of pressure having been brought to bear on the matter by the enforcement bureau. The limiting of the abalone take to the few days when there is a minus tide would certainly relieve the load placed upon the overworked and too few game wardens.

By this time you may be asking yourself what you can do to help this situation. The biggest mistake would be to offer a compromise when we are already compromised and being readied for more. There already have been some of these compromises offered timidly. I say "desist." You need merely to write a letter directly to the Calif. Fish and Game Commission, 722 Capital Avenue, Sacramento 14, California.

Make it a personal letter and tell exactly what you think of the matter. If you think your letter will have little

effect, remember what a few from the wrong people have done. There is a very small but loud minority of cranks who would abolish skin diving altogether! Believe me, they are making themselves heard in Sacramento. Don't let it stop there, but keep on letting the Dept. know what you want. It is YOUR Dept., but cannot act for you without your instructions.

The final meeting this year of the Fish and Game Commission is to be held in Sacramento Feb. 27. At this meeting the Commission will let it be known what action has been taken on the many recommendations it received at the Jan. 2nd meeting. The decisions will be made in advance of the meeting undoubtedly, and the sooner your letter is received, the more weight it will have.

THE Rose-Scuba "PRO" is designed and manufactured by Rose Aviation, Inc., with plant and offices at Aurora, Ohio. The firm was originally organized in 1950 as Rose Aviation, and performed highly specialized research and development for the United States Air Force. Plant and offices were located in Madison, Ohio.

Among the early projects were liquid oxygen equipment and accessories, along with special test equipment for Air Force breathing oxygen equipment.

Both co-founders Dudley Rose and Arthur Tidd were interested in skin diving, largely due to the latter's efforts during the early 1940's in devising escape methods from "ditched" airplanes. After a long period of experimentation and calculation, the single hose concept of scuba with the demand regulator in the mouthpiece was decided upon for a production unit. Because of its simple efficiency, it was named "PRO." Rose Aviation was incorporated in 1955 and the first "PRO" Scuba released for sale in 1956.

The "PRO" made a distinct departure from "conventional" scuba design and appearance. It featured a single hose with demand regulator in mouthpiece, and offered skin diving its first non-flooding design without the use of accessories for the purpose. Its simplicity reduced costs to a new low in the industry and helped put the sport within reach of all.

Other more recent developments by "PRO" are the use of tank-mounted pressure gauge with dial attachable to diver's belt for easy reading, cylinder

painted the new Mil-standard, Sea-Air Rescue color (Blaze-Orange, fluorescent), new "Treasure Chest" kit of complete "PRO" scuba, flippers, and mask packed in carrying case with handle, etc. Although modifications and refinements have been added, the original basic design is retained, and has led the way for others in the industry to follow. Today, single-hose outfits are common with most of the established makes.

Dudley Rose resigned from the company in 1957, Arthur Tidd became President and the company moved to Aurora, Ohio, in the early part of 1957. The engineering of all "PRO" equipment and other products of the company is directed by the President, Arthur Tidd. He was formerly Chief Engineer of the Aircraft Division of The Aero Equipment Corporation, Cleveland, Ohio, for 14 years and was responsible for the design, development, and production engineering of approximately 750,000 breathing oxygen demand regulators for the United States Air Force.

The manufacturing of the "PRO" and other products of Rose Aviation is under the direction of A. N. Abelson, who retired from The Aero Equipment Corporation after 14 years as Vice-President and Production Manager.

PRINCIPLE OF PRO

The "PRO" Scuba design is based on scientifically established principles of balancing air and water pressures at mouth level for constant and uniformly normal breathing to meet demands regardless of depths and other conditions,

and consists of essentially two major factors. 1. A cylinder pressure regulator (first stage), mounted at the cylinder valve, which reduces air pressure from the cylinder to approximately 40 p.s.i.; 2. A "demand" regulator (second stage), built into the mouthpiece, which releases air to user as desired under all conditions.

The "PRO" cylinder pressure regulator will operate with cylinders having working pressures from 3500 down to 50 p.s.i.

The 40 p.s.i. of air is conducted by a single flexible 250 p.s.i. (working pressure) hose to the demand regulator in the mouthpiece.

Thus, cylinder air is released by the cylinder pressure regulator into the hose at 40 p.s.i. and is then temporarily "reservoired" or stored in the hose for the periodical requirements of user through the demand regulator in the mouthpiece. In turn, the demand regulator further reduces air p.s.i. to meet exacting requirements of user and passes it directly into the mouth.

Exhaled air escapes through a conventional mushroom exhalation valve on the side of the mouthpiece.

PRO REGULATOR FUNCTIONS

The "PRO" "Pressure-Equalizer" Mouthpiece is so-named for its important function in the system (see diagrams). When the user creates suction by starting to breathe, the external water pressure flexing demand diaphragm (1) inwardly tilts the spring-loaded demand valve lever (2), and allows the air from the cylinder hose to



ROSE AVIATION, INC.

Box 75
Aurora, Ohio

PRO

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enter through the inhalation valve into mouthpiece and directly to user's breathing passages in the exact amount desired—no more, no less. At the start of exhalation, the diaphragm returns to normal, closing the demand "inhalation" valve, and stopping the air flow. The slight pressure of exhalation causes the mushroom exhalation valve (3), at opposite side of mouthpiece, to open, allowing the exhaled air to escape into water through adjacent port. At start of inhalation, the exhalation valve closes by force of external water pressure. The positive, inter-related action of second stage demand regulator and exhalation valve, both contained in the mouthpiece, constitute an "automatic" non-flooding feature—first of its kind in scubas. Diver can "drop" mouthpiece during dive, or pass to another diver "buddy fashion" without flooding any part of the system. Water entry to hose is prevented by closed inhalation valve (normal position). The very meager water entry into mouthpiece cavity is promptly and completely expelled by diver's first exhalation—even though slight. Eliminated are the twin hoses and the need for safety accessories to prevent hose flooding. A swivel fitting, connecting hose with mouthpiece, permits complete flexibility of "positioning" for utmost utility and comfort. No mouth cramping, no hose twisting. Tough, single, medium-pressure hose resists snags, can't "collapse" under excessive internal suction or external pressure.

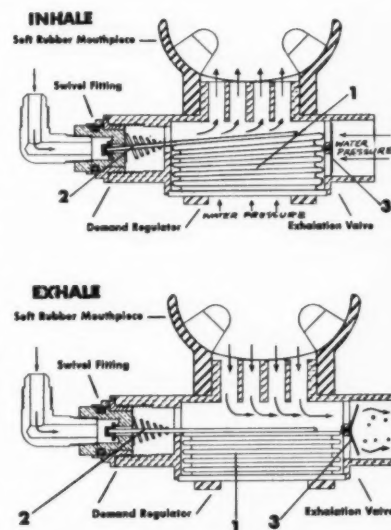
Because the demand valve and exhalation valve are located in the mouthpiece—constantly at mouth-level—breathing is as close to normal in all swimming positions, or "gymnastics," as is possible with mechanical breathing apparatus operated by the user's breathing efforts. There can be no annoying

air pressure variations due to changing depth relationship between demand regulator and mouth, regardless of depth or position of body. Since ease and dependability of breathing apparatus constitute safety for the user, "PRO's" simple efficiency was immediately in demand by divers who favored less bulky equipment, and wished to eliminate the breathing irregularities of systems whose demand regulators were not located in the mouthpiece. Summarily, the Rose-Scuba "PRO" provides adequate, effortless breathing facilities at any depth, or under any conditions the human body can endure. The "PRO" 57-C and 57-CM are constructed of stainless steel and brass parts, nickel and chrome plated to be corrosion-proof in salt water.

PRO MAINTENANCE SUGGESTIONS

The very simplicity of the "PRO" design eliminates need for detailed maintenance procedures. As a matter of routine, "PRO" owners are asked to wash the salt water from their regulators. This is to prevent an accumulation of salt around the control spring in the cylinder regulator. Because of Rose Aviation's experience with aircraft products, it has been found desirable to examine as regularly as possible, all equipment that has been in service.

This enables company engineering to spot any potential irregularities and make such adjustments or replacements as required. The refinements of "PRO" 57 series are partially the result of such procedure. For this reason, users are asked to return their "PRO" regulators to the factory any time they want a service-check or adjustment. This service is offered at no charge, except the cost of postage both ways. Any physically damaged parts are replaced at a nominal cost. This service



has relieved "PRO" dealers and users of all repair problems and responsibilities, with their accompanying hazards of do-it-yourself "tinkering"; and enables "PRO" engineering to maintain all equipment at top condition for peak performance.

SKIN DIVER RULES

Rose Aviation, Inc., does not presume to teach customers how to dive. It would be impossible to describe all the conditions that could be encountered in waters throughout the world. Rose Aviation, Inc., provides physiologically adequate breathing equipment at a price within the reach of all people. The "rules" of diving and the teaching of these rules are better left to the local training groups who will provide the do's and don't's relative to the locale and the equipment in use.



R. T. Keagle Photo

HIGH PRESSURE AIR COMPRESSORS

By MARTIN W. McWHORTER, McWhorter Engineering Co.

THIS article will deal with the why, how, and what of air compressors on a semi-technical and practical basis. A more technical discussion on air compression can be obtained from a good textbook on the subject. In the past not too much has been said about the skin diver's air supply, which is just as important to him as the regulator through which he breathes. The scuba diver without proper conditioning of air is like the hunter with no arrows for his bow.

Air compressors are classified as low (2-50 PSI, blowers), medium (50-150 PSI, single stage), and high pressure (150-50,000 PSI, up to six stages); and these three classifications fall into either a commercial or an industrial category. Commercial compressors are the types used in gasoline filling stations, painting operations, auto repair shops, etc. and generally operate in the pressure range from 50 to 200 PSI. Industrial compressors are used in industry with a pressure range from a few PSI (blowers) to 50,000 PSI (special hydraulic, pneumatic machinery and plastic extrusion work.) The scuba diver's air compressor falls in the industrial category, one reason for its being expensive.

The scuba diver must have his cylinders filled with air to a pressure of 2000-3000 PSI, that is if he intends to stay in the water for a while. For com-

pressing air to this pressure an air compressor of three to four stages is needed. The two primary reasons for the necessity of this many stages are to divide the "work" load evenly among the stages and to increase the heat dissipation factor.

Technically compressors are typed isothermal, compression at a constant temperature, and adiabatic, compression without loss of heat. An isothermal compressor has water-cooled jackets around the cylinder and cylinder head; the adiabatic compressor is air-cooled. In compressor design the heat dissipation factor is given more consideration than any other factor, since excessive heat lowers the compressor's efficiency. Increased heat forces the compressor to require additional horsepower for operation under the same load condition. Excessive heat also causes lubrication difficulties.

To give an example, according to O'Neil, a single stage compressor charging one atmosphere at 60° F. to 100 PSIG with no cooling will reach a temperature of 485° F. This temperature is very destructive to lubricating oils, causing them to burn into a gritty coke-like substance which is deposited around the valves and ports of the compressor. If we were to divide this work between two stages of compression using a compression ratio of 2.7 in each stage, we find that our first stage pressure will be 25 PSIG, which according to O'Neil will have a rise in temperature to only 234° F. Since the compression ratio is the same in the latter stage, there will likewise be only a 234° F. rise. The use of two stages of compression has therefore divided the dynamic load and heat between these two stages.

The principle illustrated by the foregoing example applies even more so when pressure of 2000 to 3000 PSI are involved. Just imagine what the heat would be on a single stage compressor charging to 2000 PSI with no cooling—approximately 1125° F. One could see what would happen if there happened to be a little oil in the cylinder, a "one shot" Diesel no less! So it's clear to us divers why three or more stages of compression are needed to compress air to 2000 PSI or above.

We have tried to explain "how" and "why"; now let's take a little closer look and see "what" we can use. The compressors most skin divers are familiar with are the Ingersoll-Rand, Cornelius, Worthington, Rix, General Electric, and Westinghouse. Of course there are other manufacturers of three and four stage compressors, such as Joy Manufacturing, Norwalk, Chicago Pneumatic, Hardy-Tynes, etc.

Let's divide the cylinder-charging compressors into three categories—portable, stationary, and semistationary. The major requirement of an ideal portable compressor is lightness in weight; other requirements are a reasonably short charging time and a long life span. These requirements are enough to make any designing engineer scratch his head and pull his hair at the same time, because these three factors are contradictory to each other. For example, a compressor turning 3400 to 4000 RPM will not have the life span of one that operates at 600 to 900 RPM. The portable compressor must make up in RPM what it lacks in cylinder volume, since the larger the cylinder volume is the

larger the compressor must be, adding more weight.

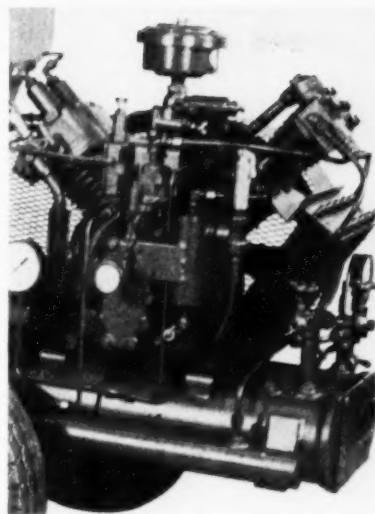
Let us take for another example a compressor with a 2" bore and a 1" stroke. The total displacement of this compressor at 4000 RPM is 7.26 CFM. To equal this displacement with a compressor turning 900 RPM, the bore would have to be 4.21" with the same 1" stroke. The compressor with the 4.21" bore will weigh approximately $2\frac{1}{2}$ times as much as the one with the 2" bore, since larger bores require heavier connecting rods, crankshafts, bearings, etc. This weight difference will generally hold true in comparison of adiabatic compressors.

The small Cornelius, Westinghouse, Weatherhead, and General Electric compressors, which are now government surplus, were designed primarily for use in the Air Force to preload hydraulic accumulators and hydropneumatic landing gear struts on aircraft. In this application weight was given greater consideration than life of the compressor. Most of these small three-stage compressors were built by Weatherhead and Cornelius under Air Force contract. These compressors operate at 3600 RPM and have a maximum rated discharge pressure of 1500 PSI. The two-stage General Electric and Westinghouse compressors, also built under Air Force contract, operate at 3600 RPM and have a maximum rated discharge pressure of 1000 PSI. Quite a few of these two and three-stage compressors have found their way to the skin diver via the war surplus market. In using one of these small compressors the diver should not exceed the load limit by more than 20%.

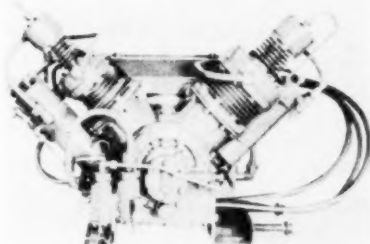
For an example let's take one of the two-stage General Electric compressors, which is factory rated 1000 PSI maximum. We find the compression ratio in each stage to be 8.17, which gives us a first stage pressure of 122.5 PSI with an adiabatic temperature of 481° F, outside temperature of 60° F. (In actual practice outside cooling plus the rapid movement of air through the compressor brings the compressor's temperature down to 356° F.) Now suppose we raise the discharge pressure to 2000 PSI. Our compression ratio is now 11.57 with a first stage pressure of 173.5 PSI and an adiabatic temperature of 740° F, outside temperature 60° F. In an actual experiment of ours, after the compressor had run for twenty minutes charging against a terminal load of 2000 PSI, the pressure began to drop, the compressor finally locked up and never ran again. On dismantling the compressor we found scored cylinder walls and damaged valves. Due to safety measures taken on this test we were unable to get an accurate temperature reading.

It is our opinion that these small two and three-stage surplus compressors will not actually "diesel" but will fail mechanically first, that is under an overloaded condition over a period of time; and that if one did "diesel"; it would be the exception rather than the rule, probably one out of 100,000 times. This opinion is based on actual experiments performed on these compressors. To sum up small portable compressors we could say that they are light in weight, have a comparatively low output (CFM), and are relatively short-lived.

The type of compressor unit most



Three stage, four cylinder compressor. Worthington model V4A3P.



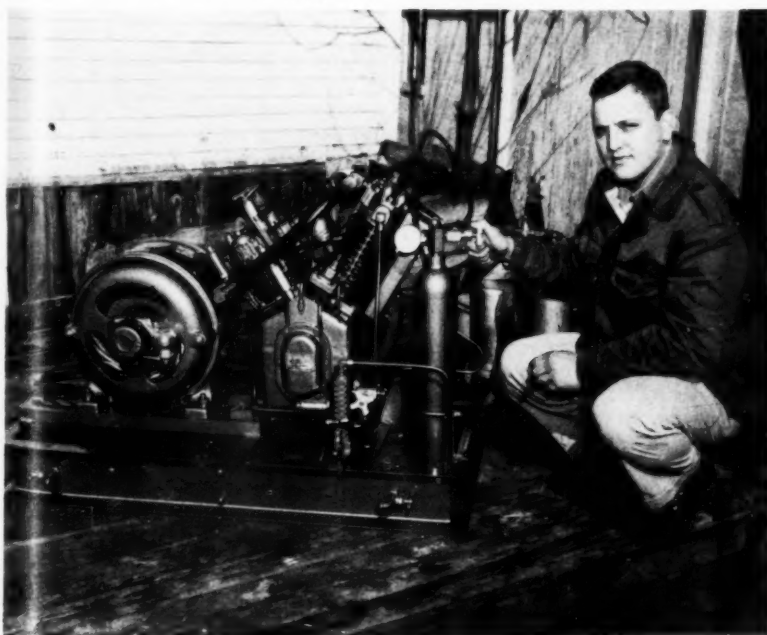
Four stage, four cylinder compressor. Joy Manufacturing Co. model 15HG.

skin divers are familiar with is the semi-stationary unit. This unit weighs between 1000 and 1400 pounds and serves as a portable as well as a stationary unit. The compressors used in these units are the three-stage adiabatic type and have a pressure range of from 2000 to 3000 PSI. Most of the compressors in this size range have a displacement from 15 to 25 CFM and operate from 600 to 900 RPM. These compressors will charge the "seventy" in three to six minutes.

The advantages of this three-stage adiabatic type compressor are long life and relatively high output. The disadvantages, here again, are in weight and size. However these disadvantages would apply only to single divers and not necessarily to a group or commercial diving shop, since this type unit made up on a trailer frame can easily be towed behind the average automobile. This type of compressor unit comes closest to fitting the needs of the skin diver because of its short charging time, comparatively long life, and relative portability.

At this time the three manufacturers of compressors suitable for these units are Ingersoll-Rand, Worthington, and Joy Manufacturing. During the last

(Continued on page 55)



Martin McWhorter gives the final inspection to an Ingersoll-Rand 3321, three stage compressor, that he has recently reconditioned for pumping breathing air into scuba cylinders.

Scuba



HEALTHWAYS

3669 Seventh Avenue
Los Angeles 16, California

RECOGNIZED for many years as a leading supplier of sporting goods products, Healthways has brought to the sports world a wide selection of outstanding sporting goods products. Under the sales direction of Randolph K. Stone, Healthways products in swim, skin diving, water skiing, exercising and golf fields have achieved world-wide acceptance in the sporting goods field.

Healthways Research and Development Group, under the direction of Gustav Dalla Valle, skin diving pioneer, maintains a continuing program designed to bring new and improved products to the sportsman. Through the efforts of this group and other leading underwater experts, the Healthways Scuba Regulator was conceived, developed and perfected.

SCUBA CONSTRUCTION FEATURES

The Scuba gives effortless breathing regardless of the position of the diver. The pressure-compensated exhaling valve assures equalized exhalation in any position—the air supply in every tank is fully utilized. A depth-compensated automatic positive air reserve that requires no adjustment has been engineered into the regulator. All internal moving parts are stainless steel and monel of high-quality chromed brass that resists corrosion, electrolysis or other chemical action. The Scuba regulator case is constructed of the highest quality 40 thousandths brass with a case clamp of stainless steel. The regulator dia-

phragm is made of nylon impregnated with fairprene—a combination that is extremely tough, resists aging and has amazing flexibility. The designed precision intake valve reduces air turbulence and offers easy breathing with air response on the slightest demand. The simplicity of design and the minimum number of moving parts in the Scuba assures trouble-free performance and a minimum amount of maintenance.

The Scuba is equipped with the Hope-Page Non-Return Valve. An offset mouthpiece port places the valve in the ideal position and the thermo-plastic construction assures comfort. The valve permits removal and replacement of the mouthpiece while submerged and completely prevents water from entering the hoses and subsequently the regulator mechanism.

SCUBA OPERATING FEATURES

In engineering the Scuba's depth-compensated air reserve, it was Healthways objective to eliminate the element of human error and mechanical malfunction. The air reserve is automatic.

The automatic air reserve functions in accordance with an infallible law of physics wherein *a stream of air will flow through an orifice of a given size in direct proportion to the pressure of the air behind the orifice*. As a result of this law the amount of reserve air in the tank will always be proportional to the outside water pressure and the requirements of the individual.

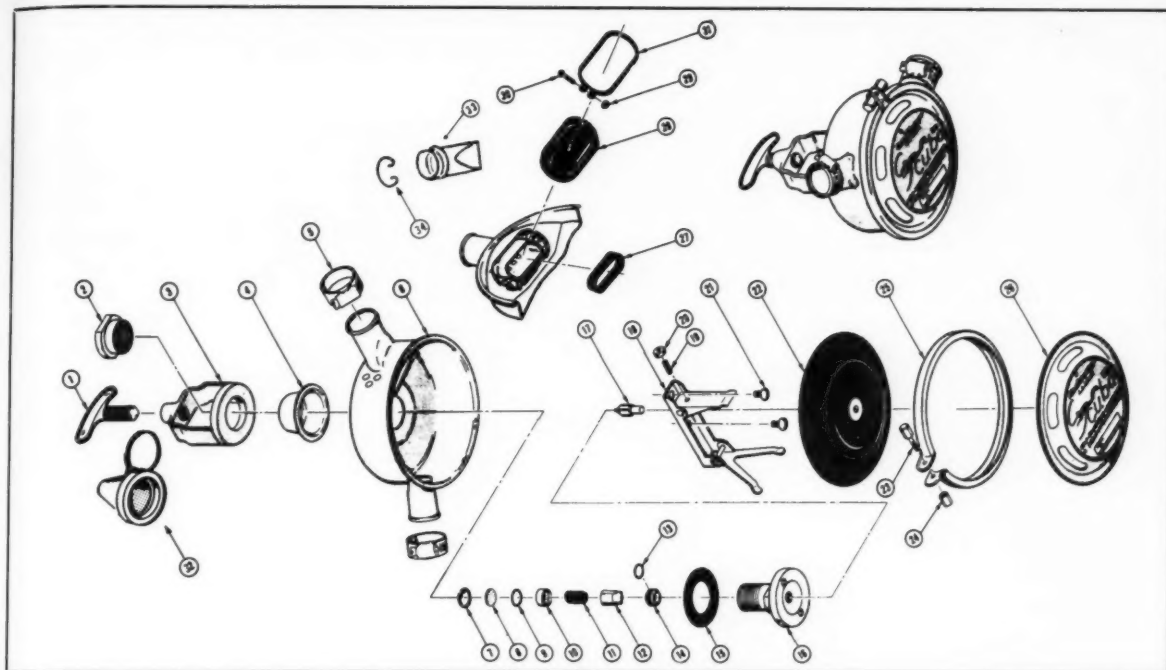
The diver becomes aware of the automatic function of the air reserve when there is a noticeable restriction in the ease of breathing. The point at which this restriction occurs depends upon depth and individual air consumption. This restriction indicates that the diver must begin his ascent. At this point the reserve air supply will be sufficient at all times to enable the diver to breathe easily during the normal rate of ascent to the surface.

In the event the diver should find it necessary to descend for a few feet before starting to the surface, he may do so for a short period provided he uses controlled breathing, taking long slow inhalations.

SCUBA GENERAL MAINTENANCE INSTRUCTIONS

At all times after using the Scuba, remove the regulator from the cylinder valve and tighten the protection cap (fig. 32) in place on the regulator. Always thoroughly wash the cylinder, cylinder valve and regulator assembly in fresh water after using!

An occasional slow leak may develop in the Regulator as a result of foreign matter such as dirt, silt, etc., getting into the High Pressure Block. Leakage resulting from foreign matter in the High Pressure Block can be corrected by cleaning or replacing the High Pressure Valve Plunger (fig. 12). This High Pressure Nylon Valve Plunger, after be-



ing cleaned, can be reseated by gently turning the cone or end of the Valve Plunger against the Valve Seat (fig. 14). Many times this simply action, if done gently, will be sufficient to stop a slow leak. You must do this only while the Valve Seat and the Plunger are in the Valve Body (fig. 16), because this is the only way to smooth down the seating area with all parts in perfect alignment. The Valve Seat (fig. 14) is removable for easy replacement and can also be turned over and used on the other side. (Both sides have a high precision finish.)

After cleaning and all adjustments have been made, if there should be a restriction in the normal ease of breathing, this may be due to the fact that the Valve Plunger (fig. 12) needs replacing, because continuous smoothing out or turning of the nylon portion has permitted the stainless tip of the Plunger to seat too deeply in the Valve Seat (fig. 14). In such cases, replace the High Pressure Valve Plunger (fig. 12).

A slow air leak can also develop in any regulator if the levers in the Linkage Assembly (fig. 18) get out of adjustment. The Compound Levers in the Linkage Assembly can be adjusted with a single Adjusting Screw (fig. 19) to control the flow of air. This single Adjusting Screw (fig. 19) is the only adjustment that can or ever need be made to control the proper flow of air in the Scuba regulator.

By turning the Adjusting Screw in (clockwise), you increase the pressure of the Lever against the Diaphragm, which increases the flow of air. By turning the Adjusting Screw out (count-

ter clockwise), you decrease the pressure of the Lever against the Diaphragm and thereby decrease the flow of air.

Adjust the Regulator only when it is mounted on a tank . . . for best adjustment the tank should have pressure of 300 to 500 pounds.

For best results, always keep the Adjusting Screw turned in (clockwise) as far as possible, but only to the point where the air will not flow by itself when the Diaphragm is reassembled on the Regulator.

CHECKING OUT YOUR REGULATOR

Water getting into the inhale hose may be the result of a hole or cut. It may also result from holes in the Diaphragms, loose Diaphragm Clamps, or from leaky Non-Return Check Valves. Water may also enter as a result of holding the mouthpiece incorrectly in the mouth. It is also well to check for possible holes or cuts in the exhale hose. After you have checked all of the foregoing points, if you still find water in the exhale hose, then check the Exhaust Auxiliary Valve (fig. 27) to see if it is properly positioned or if it has holes or cuts. Exhaust Auxiliary Valve (fig. 27) is in proper position when it is centered over and covers completely the Auxiliary Exhaust Ports or holes. It is always advisable to inspect the hoses for cuts in the area where the hoses are clamped to the inhale and the exhale ports of the Regulator.

To check the hoses and possible air leaks in the Diaphragms or connections, connect the Scuba Regulator to the Cylinder Valve. Next inhale strongly before opening the Cylinder Valve. Listen carefully for possible air leakage. Then open

the Cylinder Valve fully, but do it slowly. Next place the mouthpiece in the mouth . . . inhale and exhale to see if the Regulator operates correctly.

If the Main Diaphragm (fig. 22) or the Exhaust Diaphragm (fig. 28) is leaking, replace with a new one. When reassembling the Scuba Regulator, it is always important to be sure that you seat and properly locate the Main Diaphragm (fig. 22) before completing the assembly with the Regulator Cover (fig. 26) and Case Clamp (fig. 25). The Main Diaphragm should always be seated with its rubber gasket edge facing and seated on the rim of the Regulator Case (fig. 6). Care must be taken to have the Diaphragm perfectly flat without any creases of any kind.

Check the Regulator after assembly in the following manner: Place the Regulator on the Tank Valve, but do not open the Tank Valve. Then inhale deeply. If the assembly is not correct, then you will be aware of an air leakage and you will not be able to create the partial vacuum that will normally develop if the Diaphragm is properly seated. It is very easy to distinguish the difference by simply listening as you attempt to inhale deeply. This simple test will insure that this Main Diaphragm is properly assembled in the Case.

Always check the Case Clamp (fig. 25) and the Exhaust Diaphragm Clamp (fig. 31) to make sure that they are properly positioned and secure. If a Non-Return Check Valve is leaking, remove the hoses from the mouthpiece and if necessary replace the Non-Return Check Valve. >

SOME PRINCIPLES OF SELF-CONTAINED UNDERWATER BREATHING APPARATUS

By R. STUART MACKAY

Reprinted from "Science"
October 24, 1958

With the increasing use of self-contained underwater breathing apparatus in archeological collection work, geological and petroleum prospecting, and biological collecting, diving equipment has taken on real importance as a scientific tool. Numerous techniques have evolved to make diving units easier to breathe from so that divers can make longer work or exploratory dives and so that neophytes will be less likely to suffer lung fatigue. This report (1) presents a brief résumé of some of the principles of existing apparatus along with concepts leading to more advanced forms. The principal emphasis is on "open circuit" equipment in which air is inspired from a high-pressure tank and expired into the surrounding water. In such cases the compressed air is also an energy source, which allows incorporation of certain forms of regenerative feedback leading to easier breathing.

Such equipment uses a regulator which feeds the diver air at a pressure just equal to that of the surrounding water. In essence, a regulator is a box with a flexible side which activates an internal valve. If the air pressure within this box is reduced to below that of the surrounding water, then the valve will be opened by the diaphragm, thus allowing air from the high-pressure cylinder to enter the box, until the equality of internal and external pressure is returned. Through a hose, the diver breathes from this box. When he exhales, his breath travels through the other hose attached to the mouthpiece or mask and out through a one-way valve which is positioned close to the diaphragm. If the outlet (for example, a "Bronx cheer") is $\frac{1}{2}$ in. from the valve is set so that slightly more than $\frac{1}{2}$ in. of water vacuum must be produced in the diver's mouth before air will be fed, or else, in some diving positions, air will spontaneously stream from the regulator and out through the exit valve. Other factors being the same, single-stage regulators tend to breathe more easily, while two-stage regulators tend to give more uniform breathing difficulty as the tank pressure drops.

If a small collapsible bag is attached to this air system, then as one breathes out, a few hundred cubic centimeters of the breath are saved and will be the first air to be inspired on the succeeding breath, of which it makes up only a fraction of the total (the rest being supplied by the regulator). Some of the early observations on such a method should be credited to C. Lambertson. The advantage to be obtained by such a partial re-breathing process in practice is not simple to predict and seems to decrease with active work.

If one builds a unit from which it is easy to breathe on land, one will still inevitably find that there is an appreciable amount of work required to draw in a breath when one is below the surface of the water and in the usual face-down position. Because the diaphragm is then situated above one's lungs, the air that one must inspire is at a slightly lower pressure than the average water pressure on the lungs. When a diver is on his back the pressure differential is in the opposite sense, and one's lungs have no greater strength to work against such pressure differentials, so the strain is again appreciable. Most people have little concept of the relative weakness of their breathing apparatus compared with typical small hydrostatic forces (2). One can effectively locate the regulator within the lungs and obtain normal equally easy breathing in all positions by loading the diaphragm of the last-stage regulator with a suitable weight (Fig. 1). This weight must supply a force to the diaphragm that a column of water extending between the diaphragm and the center of the chest will exert. A diaphragm-sized weight's thickness is thus approximately half the chest thickness divided by the specific gravity of the weight material. The weight can be supported by the linkage and then, depending on whether the weight pushes or pulls on the diaphragm, the regulator must face toward or away from the person; the direction it faces will be reversed if the regulator is worn on the chest rather than upon the back. If a regulator is oriented so that the weight's line of motion passes through the center of the lungs, then it can be compensated though fixed to some part of the body

other than the center of the back. Such a unit allows perfectly free inspiration under all conditions, but in one set of positions the effort in exhaling will be as difficult as it is with an uncompensated unit. Voiding the air into a lower-pressure reservoir such as a branched arrangement of tubes pointing in several directions, each with a one-way valve at its far end, can do away with even this slight inconvenience. The effect of separation of regulator and outlet valve by this procedure can be overcome by making the outlet slave-controlled by diaphragm motion, besides having its normal one-way action. There can then be no leakage of air or water in any position. A closed circuit (rebreather) unit can be similarly compensated with a weight, and in this case there is no outlet valve. Questions of hunting because of the extra mass included in the feedback loop, or of difficulty in obtaining a sudden breath because of diaphragm inertia, prove experimentally unfounded in a reasonable design.

The action of a regulator can be im-

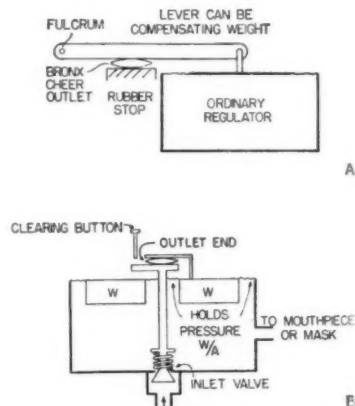


Fig. 1. (A) Modification of a regulator to allow normal equally easy breathing in all positions. Bending the end of the "Bronx cheer" is found to seal it more easily than clamping or compressing. (B) Configuration that allows the inclusion of a clearing button to expel water accidentally entering the unit, and which insures that one valve will close before the other opens. A lever is not needed if the area of the outlet is considerably less than that of the diaphragm.



Members of the "Urheilusukeltajat" diving club in Helsinki, Finland, take their usual Sunday dive during December. Correspondent Ora Pataharju advises that this is a new name for the club. They were called the "Barracuda" club but after searching for more than a year and not finding any of the tropical fish, decided to change the name to one a little more Finnish.

proved by positive feedback which brings about increased air flow by the act of starting to pass air. If the feedback factor is made high enough so that the loop gain in this system is greater than or equal to unity, then the system will become bistable (3)—that is, a small suck will bring about a self-perpetuating air flow that will persist until back pressure builds up. No effort is involved in breathing in the intermediate condition. Limited positive feedback makes breathing easier, but the use of hysteresis or bistability requires further experiment to determine whether, due to nonlinearity in muscle response, it may not take more work to start and stop a self-perpetuating flow than to produce a steady vacuum in the usual fashion. However, human muscles do seem to be able to give a short intense effort more readily than a weaker prolonged one. Methods of producing the bistability (feeding air or not feeding air) include constructing the diaphragm in the fashion of an oil-can bottom, spring-loading the linkage as in a toggle switch, shaping the valve seat so that opening gives an increasing area to produce an increased opening force, or the use of a Venturi tube in which air flow reduces the pressure applied to the diaphragm, thus sucking it in. By

analogy with the generation of a nerve impulse, or the action of monostable multivibrator, one can visualize another type of unit in which a bistable regulator is returned after a short interval to its original off state by some auxiliary process such as a slow leak into the main chamber from the high pressure region.

Breathing can be made easier by eliminating impedance to flow through the inclusion of the hoses in the feedback loop. For any such configuration two essentially isolated chambers are involved. For example, sucking, via one hose, could cause the diaphragm to move in and feed air into and from the second hose until the pressure backs up through both. One exhales into and from the chamber containing the diaphragm through the first hose.

One problem of deep diving might be touched upon. It is necessary that the partial pressure of oxygen at all depths be roughly within a factor of ten above normal at the surface in order to avoid either oxygen deficiency or poisoning. In discussion, M. Bradner suggested storing oxygen in a hemoglobin-like material which would always then maintain the surrounding partial pressure constant at the equilibrium value. The extra pressure, to match that in the surroundings,

would be supplied through a regulator by a high-pressure cylinder of helium or nitrogen which would have to supply gas only during descent, and thus could be small. Alternatively, a mixed-gas apparatus could either receive oxygen from a pressure-insensitive, constant-flow-rate device, or else an oxygen-detecting element could be used to control the flow. For a detector, for example, one might employ the output voltage of a fuel cell (4). H. Bradner has suggested that oxygen content might be controlled by the mechanical changes in size of certain chelates or else by the output voltage of any oxygen-depolarized battery. Alternatively, one could control oxygen flow by monitoring the generation of carbon dioxide.

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References and Notes

1. This work was supported in part by a grant from the Schussler Fund. The weight-compensated regulator was previously described in *Seafarer* [1, No. 2, 3 (1954)].
2. R. S. Mackay, *Am. J. Phys.* 16, 186 (1948).
3. —, *ibid.* 26, 60 (1958); *J. Appl. Phys.* 25, 424 (1954).
4. *Chem. and Eng. News* 35, No. 38, 25 (1957).

"aqua-lung"

AQUA-MATIC

U. S. DIVERS COMPANY

11201 West Pico Blvd.
Los Angeles 64, California

This unit, called the one hose type unit, designed by Cousteau and Gagnan in 1951, has been on the market since the beginning of 1957. Its low price, the quality of its design and of its construction have made this regulator extremely appreciated in all of the diving field.

PRINCIPLES OF THE AQUA-MATIC

This is a two stage demand regulator (see the full description of these principles under Aqua-Master). With the Aqua-Matic the exhaling valve is incorporated in the diaphragm. There are no leaks regardless of the position of the diver.

The two stages are separated. The first stage is fastened to the tank valve, the second stage is in the mouthpiece. This solution presents the advantage that the height of the water between the diaphragm and the center of the diver's lungs, in the normal position, does not have to be fought against. The Aqua-Matic breathes very easily underwater.

The Aqua-Matic can easily be converted to a Hookahmatic. The second stage is connected to an air supply at the surface through a low pressure hose. See the current U. S. Divers Co. catalog for a full description of this hook up.

"Deluxe" Aqua-Matic Features—a two-way mouthpiece. The mouthpiece is connected either to the regulator, or to a snorkel. When at the surface, the diver is "on snorkel". Before diving he just turns the valve "On Aqua-Lung". Also there is a clear easy button which

gives an immediate delivery of air to the diver by a single push of the hand, in case an exhaustive effort has to be made.

FUNCTIONS OF THE AQUA-MATIC

When the diver breathes the diaphragm 36 moves toward the inner part of the mouthpiece housing. The lever actuator 32, which is fastened to the diaphragm, operates the two levers 27, which in turn pull the disc assembly off the seat. The air begins to flow. The pressure within the Intermediate pressure hose decreases, in the first stage. The diaphragm 17 moves up. The lever bridge activates the two levers 14 which pull down the stem assembly 9. The air flows from the first stage to the second stage. When the diver ceases to breathe in, the diaphragm comes back to its initial position, the disc assembly is pushed back by its spring against the seat. The air does not flow any more. The pressure builds up in the intermediate hose and the first stage closes.

A very important point—If the first stage leaks (in case a piece of dust comes between the stem assembly and the seat) the pressure builds up a little in the hose, but immediately opens the second stage by overcoming the strength of the spring 26.

AQUA-MATIC MAINTENANCE

Respect the general rules enforced for all regulators. Change the hose every other year or if it presents some signs of fatigue. Every year check the diaphragm assembly by taking off the collar 38 and the tape. Check the condition of the internal rubber parts.

Role of the Adjusting Screw 20—If your regulator becomes too hard to breathe, or if it leaks a little at the second stage, you have to adjust the Screw 20. Too hard to breathe! Screw it to the front until second stage leaks and then unscrew one-half turn. In case of leakage, unscrew 20 to make adjustment. Be careful to leave at least one complete thread engaged.

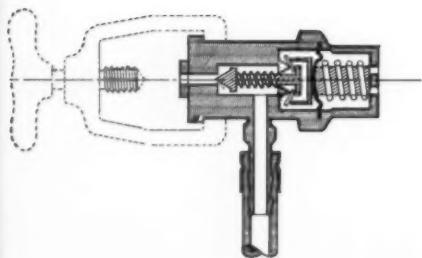
The Aqua-Matic hose is a very high quality pressure hose, used generally under pressures varying from 110 p.s.i. to 150 p.s.i. and can withstand pressures up to 1500 p.s.i. However it is recommended that the hose be changed every other year.



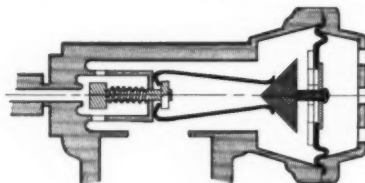
Deluxe



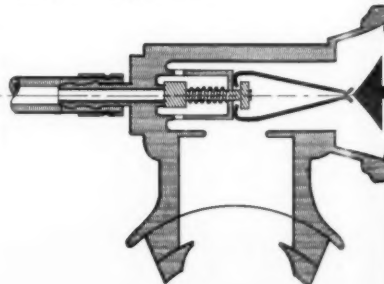
Standard



First Stage - Open



Second Stage - Open



Second Stage - Closed

TAKE CARE OF THAT SUIT

By DUKE HUNTER

How many skin divers really give their rubber suits the care that the suits deserve? Very few of the divers I know do! For myself, after a long day in the water, I'm anxious to get into the house and bathe, eat and then relax with the evening paper or watch TV. Therefore, I very easily got into the habit of dumping my suit—and other gear—somewhere in the garage and cleaning it up the next day. Furthermore, allowing my suit to be stored in the same folded position for many weeks, without being moved, caused severe damage. As a result I have had to buy four suits in seven years.

Six weeks ago I bought a new heavy wet suit. I decided to take real good care of it. At first I tried to keep it folded up in my dresser drawer. However, during the first two or three weeks, large creases began forming down the length of the legs and near the crotch. The sleeves and sides of the coat began doing the same. Something had to be done.


My wife finally came up with a very good, simple idea.

We decided to take an old shirt and stuff it with newspapers, after sewing up the neck, the two cuffs and the bottom. Then we took an old pair of my trousers and filled them with newspapers also.

Now when I return home from diving, I wash the suit in fresh water—allow it to dry—then stuff this paper filled shirt and trousers into the rubber suit and leave the whole works in the back bedroom. The suit could stay like this for many months and never be moved. There is no part of the rubber suit that is creased or folded in any way. There is plenty of air reaching every surface. Most important, there is no rubber against rubber for long periods of time.

I believe that any rubber suit kept like this will last many years. Anyway, it will be interesting to learn what dealers and other divers think of the idea!

Of course, there will be many divers faced with the problem of limited space. For instance, those who are living in house trailers or small apartments. Perhaps the suit could be kept under the bed. However, this way, a guy's wife just might be accused of hiding a stranger under the bed.

Oh well, it's fun to joke, but seriously, I think these suits cost too much money not to give them the very best of care. 

UNDERWATER RECREATION IN LOS ANGELES COUNTY

By AL TILLMAN

It has always been there. A great mystery lying in the dark of the sea, drawing us forward. It is not an exploration reserved for scientists. Any man in the course of his leisure recreation time can become part of exciting adventures underwater, some equal in excitement to the penetration of a lost jungle or a trip to the moon. It was with this realization, the Los Angeles County Department of Parks and Recreation, the largest such department in America, undertook in the summer of 1953 the initial steps in the development of an extensive safety, education, and recreation program in skin diving.

A simple office memorandum from a skin diving department employee, Al Tillman, caught the imagination of two alert administrators; Department head, Norm Johnson and Sports Director, Chuck Bolinger. They listened over a cup of coffee to the story of Tillman's past weekend of dodging careless spear guns and observing dozens of eager, untrained citizens in pursuit of a fascinating new recreation activity. Both men were keenly sensitive to a new responsibility that was about to plague them far and beyond their then current concerns over public operated dragstrips and control of bow and arrow hunting.

The field of skin diving safety was obviously one of an aquatics nature and the assignment of responsibility went to that division with the stipulation that Al Tillman representing the recreation division would serve in a cooperative coordinating capacity.


The Aquatics division selected a bright young lifeguard, Bev Morgan, who volunteered to work out a possible safety program. Research and investigation in the Fall of 1953 and Winter Spring of 1954 revealed a number of existing programs across the country. Two local operations provided the greatest source of basic foundation material . . . E. R. Cross's Sparling School of Diving and Scripps Institution of Oceanography. Morgan and Tillman were authorized to attend available

classes in their preparation of a program and Morgan selected Conrad Limbaugh's tutelage at Scripps as the best resource for the progress of the County program.

It should be noted here that Conrad Limbaugh, E. R. Cross, and Fred Schwankovsky Water Safety Director of the Long Beach Chapter, American Red Cross in 1954 were instrumental figures in the inauguration of the Los Angeles County program.

Bev Morgan displayed the brilliance of his future-to-be in diving as he compiled the ideas and information of the people around him into the effective manual *Underwater Safety*, the forerunner of popular training manual, *Underwater Recreation*.

With the publication of the manual came the request for actual classes for the civilian-recreation minded diver (The navy training was designed for military use, Scripps for Scientific Research, and Sparling's for the commercial diver). A series of classes categorized as Beginning Skin Diving, Advanced Skin Diving, and Scuba diving were set up in three county pools geographically scattered through Los Angeles County. The classes were held for one hour, one night a week for six weeks. The beginning class drew a small group of youngsters, the advanced skin diving drew the largest participation, and each of the scuba classes were attended by five or six people who owned their own units. A total of about 500 people were processed in the two six week sessions held during the summer of 1954. The climaxing activity was an ocean dive off Torrance Beach in the Palos Verdes diving area. Instruction and supervision for the program was spear headed by Bev Morgan assisted by Ramsey Parks (Andrea Doria fame) and Al Tillman.

The next article will relate the loss of Bev Morgan, the transfer of the underwater program to Sports Division and the accelerated program of 1955 featuring the first instructor's course. 



THE Northill Air-Lung, underwater breathing regulator that "breathes like a breeze", is produced by The Garrett Corporation's Air Cruisers Division, in Belmar, New Jersey. The company is under the administration of Walter Clark, manager.

An instrument of precision manufacture, the Air-Lung was scientifically designed by Garrett's AiResearch Manufacturing Division, Los Angeles, the world's foremost designers and producers of air pressure controls.

It was from valuable experience gained in development of aircraft pressurization systems that two AiResearch engineers, Robert Kimes and Robert Kesler, drew the know-how to produce the Northill Air-Lung. This regulator was designed to meet U. S. Navy requirements, including ease of breathing under conditions of exertion in deep locations. It is tested and manufactured to the most rigid aircraft and marine safety specifications. The unit has been approved and is being used by the Navy.

It is precision built for trouble-free durability and effortless swimming. Test units have operated over one million breathing cycles with no indication of malfunction or wear.

Air-Lung production for the U. S. Navy began in 1954 after extensive development and testing operations, and

the following year it was made available to the public. However, the Northill Company was first organized by Garrett in 1940 to produce the Northill lightweight anchor in Los Angeles. Then in June, 1956, Northill was merged with Garrett's Air Cruisers Division and Air-Lung production activities were shifted to Belmar, N. J.

The Northill Air-Lung has extremely low breathing resistance, permitting ease of breathing at all depths and in all body positions. In addition, the air supply is always fresh, air is not reused.

This breathing ease factor also aids in conserving the air supply, allowing the swimmer to breathe only the amount of air he actually needs. Another air saver is the scientifically designed mouthpiece with its surface breathing valve. This allows the swimmer to breathe surface air and save his compressed supply for use only when actually swimming underwater.

A depth-compensated reserve air valve is provided as an integral part of the regulator, to give the user ample time to surface under all conditions. Positive warning, by a need for increased breathing effort, is given to indicate that the normal air supply is nearly consumed and the air reserve release should be actuated.

Comfort has been given important consideration for use of the Northill

Air-Lung. Design of the mouth bit prevents jaw fatigue. The hose and mouth-piece assembly are very light, well balanced and highly flexible, presenting no impediment to the movements of the swimmer.

PRINCIPLES OF AIR-LUNG OPERATION

The Northill Air-Lung affords ease of breathing through the use of a variable stage metering system. This system automatically maintains inhalation effort at a constant minimum even though the pressure of the air supply is decreasing as the air is used.

When the air leaves the tank it passes through a filter in the Air-Lung then enters the pressure port and passes through the reserve air valve. It moves through the metering valve (1) into the inhalation hose which carries it to the mouthpiece, from where it is inhaled by the diver.

In exhalation, the air goes back into the mouthpiece, through the exhalation hose to the regulator. There it opens a check valve (6) located on the diaphragm and escapes.

Air is metered to the user only on demand for fullest conservation of the supply. When the diver inhales, water pressure pushes in on the diaphragm assembly (2) which acts on three levers (3) to lift the metering valve out of its seat permitting flow of air into the inhalation hose.

The reserve air valve permits passage of the air from the pressure tank until the supply begins to get low. Then it begins to resist the flow from the tank. This creates a noticeable breathing resistance which warns the diver, who then releases the reserve valve by pulling the a small lanyard (4) attached to the reserve valve actuator (5). With the remaining air supply given free passage to the metering valve, he can make a normal ascent to the surface.

DETAILS OF AIR-LUNG FUNCTIONS

A floating valve seat (7) is the principle which permits the metering system in the Northill Air-Lung to automatically maintain the inhalation effort at a constant low level. Its function is best explained in this manner:

The metering valve is spring-held (8) against high pressure air from the supply tank. Normally this would mean that required breathing effort would be easier at first, then get progressively more difficult as the diminishing pressure of the air supply gives less "lift" to the metering valve.

However, the floating valve seat, which is held in one direction by a spring (9), has a surplus area exposed to the pressurized air from the opposite direction. High air pressure forces the valve seat against the metering valve, increasing metering valve spring

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tension, to offset strong air pressure "lift" on the metering valve. Under these full tank conditions, the Air-Lung regulator has been designed to function with easy breathing effort.

As air supply pressure diminishes with use, the floating valve seat eases its force against the metering valve, decreasing spring tension. At the same time, diminishing air pressure is giving less "lift" to the metering valve. Result is a constant balance of pressures around the metering valve. Therefore, the breathing effort needed to open the metering valve remains the same throughout the consumption of the normal air supply.

The diaphragm assembly in the regulator includes a check valve which remains closed during inhalation. During exhalation, the expelled air pushes open the check valve, and escapes through the vents provided.

To insure a reserve of air, the reserve air valve is placed in the air passageway ahead of the main metering valve. The reserve valve is held in its seat by a spring opposing the air pressure. The spring is designed to release air at pressures greater than 300 psi.

As the pressure approaches 300 psi it ceases to be strong enough to open the valve, causing increased breathing resistance. Heeding this warning, the diver moves the valve away from its seat by means of the lanyard operated lever. The valve remains in the open position to give free flow to the remaining air.

Another Northill Air-Lung feature for conservation of air is the mouthpiece surface/diving valve. It is operated by rotating the air hoses in the mouthpiece assembly.

To conserve air on the surface while preparing to dive place the mouthpiece

valve in "surface" position. When in this position, the hoses are sealed off from the mouth bit, and water cannot enter the hoses. Surface breathing may then be accomplished through the bit and the openings in the valve body. Or, the bit may be removed from the mouth and breathing done normally.

When rotated to "Diving" position, the valve permits the diver to receive air from the inhalation hose and discharge air through the exhaust hose. An intermediate position permits ejection of water from the mouthpiece while submerged.

Each part of the Northill Air-Lung is of strong construction. There are no flimsy components. Compatible materials minimize electrolytic action and the possibility of corrosion.

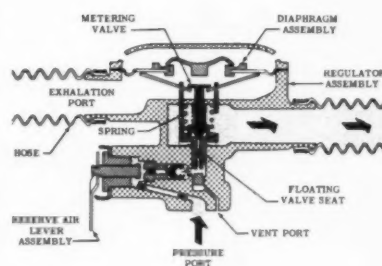
The regulator valve is machined from solid brass. Cylinders are hot-dipped galvanized to resist corrosion. The diaphragm, check valve and air hoses are of Neoprene, which is not affected by salt water, aging or exposure to the sun. The filter is made of sintered metal to prevent passage of foreign particles.

Under normal operation, no water will enter the regulator no matter how long the diver is submerged. In the event of flooding because of accidental dislodging of the mouthpiece, the regulator can easily be cleared while submerged.

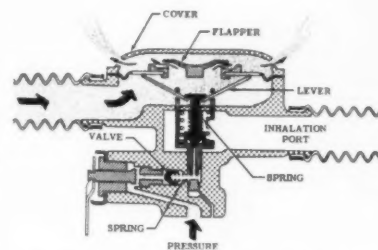
SERVICE AND MAINTENANCE

The Air-Lung was designed to make maintenance easy for any scuba diver. Disassembly, complete cleaning and re-assembly can be accomplished in ten minutes. No adjustment or calibration is necessary. The only tool that is required for these operations is a screw-driver.

INHALATION OPERATION



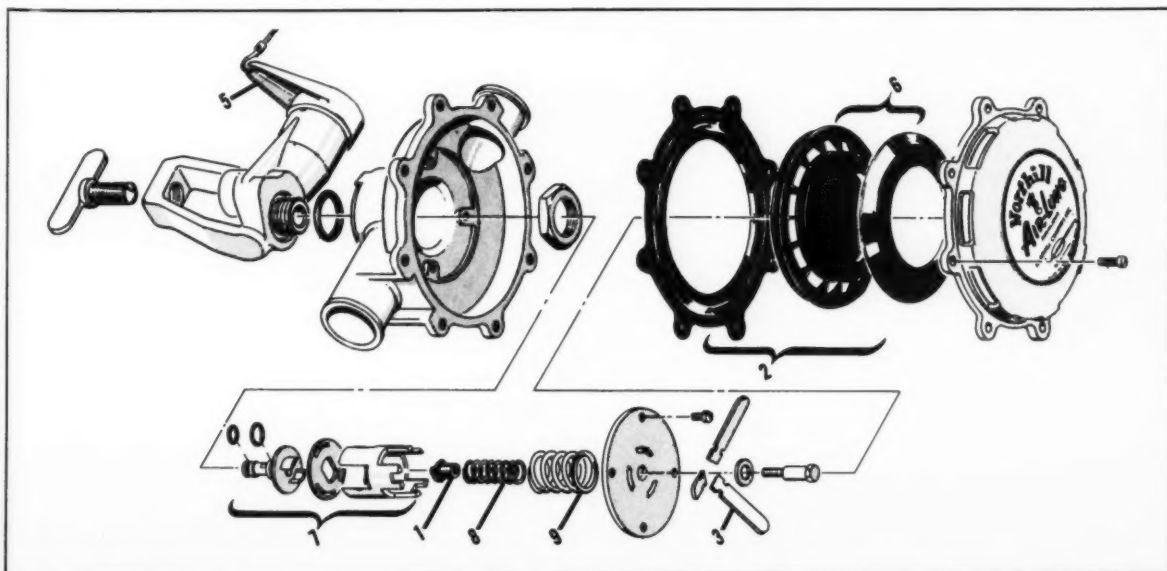
EXHALATION OPERATION



The filter should be visually inspected prior to installing on the cylinder valve. If dirt is present, remove the filter and clean according to directions given.

Occasionally, the Air-Lung should be disassembled for inspection and cleaning. With normal care, the Northill Air-Lung need only be rinsed in fresh water and dried before storage.

Complete overhaul (probably required only after several years' operation) can be accomplished with the addition of only a socket wrench and a pair of locking pliers.





"aqua-lung"

MISTRAL

U. S. DIVERS COMPANY

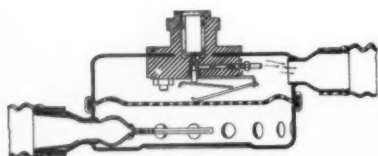
11201 West Pico Blvd.
Los Angeles 64, California

THE "Mistral", used now by the "Calypso" team is a very easy breathing regulator, especially at great depths; this comes from the extremely good overpressure characteristic of the regulator.

MISTRAL PRINCIPLE

This is a demand regulator (see Aqua-Master). The "Mistral" automatically balances the pressure of the surrounding water (see Aqua-Master).

Features the Cousteau-Gagnan principle of having the exhaling valve close to the diaphragm. (See Aqua-Master).



It is a *one stage regulator*; the pressure of the air in the tank is reduced to the pressure of the surrounding water in one stage.

The Mistral features a Venturi action, with a beautifully designed orifice which balance the flow going directly into the outlet tube of the top box, and the flow going into the box itself. The overpressure is thus controlled and stabilized to the required value.

DETAILS OF THE REGULATOR FUNCTION

When you breathe in, you create a suction pressure in the box under the diaphragm. The diaphragm moves upwards, thus activating the two combined levers (9158-6 and 5), which pushes the pin (9158-3). The pin pushes the seat assembly (9158-56). The valve is open. The air flows. Since an "O" ring is preventing the air from going around the pin, it goes through the orifice

(9198-16). When the air begins to flow, according to the principle of the Venturi, a suction pressure is created around the outlet tube. This suction pressure, exerted under the diaphragm helps it go up, thus relieving the diver's efforts. This is the reason why the breathing curve of the "Mistral" is almost vertical, meaning the effort you exert will not change substantially regardless of the quantity of air required. When you cease to breathe, the pressure builds up in the box; the diaphragm comes back to its initial position; the seat comes down; the valve is closed.

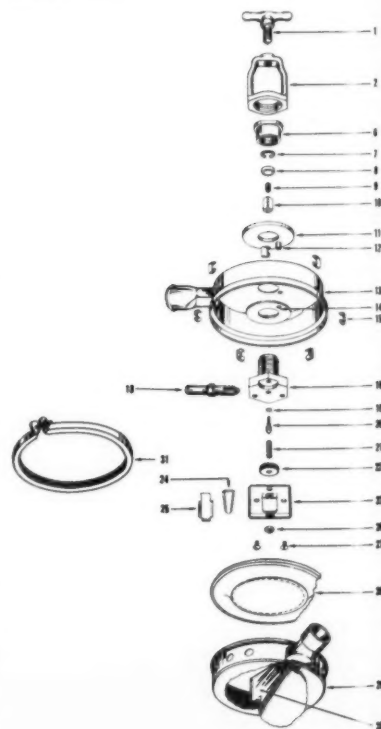
Exhalation—As in the Aqua-Master, the exhaling valve is folded over the bottom box inlet tube edges. It is easy to check it by taking off the hose clamp and the hose.

SERVICE & MAINTENANCE

See the instruction for the Aqua-Master.—Have your regulator checked every year. For maintenance, read "Diving with the Aqua-Lung", page 28.

If your regulator is hard to breathe, the levers are not correctly settled. Open the box, check the level of the top lever and bring it flush with the edge of the top box. This adjustment is obtained from nut #11 which can move freely only after loosening the screws #15.

If your high pressure seat leaks, you can check it without opening the box. Take off the circlip 23. The seat has to be taken off and polished on a very soft stone. Most of the time it will do the job without need of replacement.



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Let's talk about . . .

UNDERSEA PHOTOGRAPHY

By

ERNEST H. BROOKS

President and Founder

Brooks Institute of Photography




Thank you very much for your letters, problems and questions. It is difficult at times to give specific answers to some of your problems, because of insufficient details given, which in hand, leave me with too many unknowns. I will try to cover the 8mm motion picture inquiry inquiries this time.

I believe the automatic exposure camera is tailor-made for the amateur motion picture field. Automatic exposure allows the movie maker to follow his subject from the surface to reasonable depths and back to the surface, keeping the exposure correct at all times. The Keystone KA-1 and KA-3 are exceptions to the above, in that the automatic exposure control does not alter the lens opening while the camera is in operation during a film run. Most likely you will use the wide angle lens underwater; however, if you can only afford one camera, a turret with three lenses is the best investment. Most of the major camera manufacturers are making automatic exposure 8mm cameras. Visit your camera dealer, have him show and explain the merits of each plus the prices. All carry guarantees and there is no reason to believe they will not work underwater in the proper housing.

If you are being caught with your camera run down, and seem to be never ready for fast action, or your camera motor is running down during an exciting scene, try an electric drive. Too expensive? You can purchase a movie camera with an electric drive for less than \$50.00. I am referring to the Eumig, an 8mm camera that is claimed by its importer to run up to twenty rolls of film on four penlight cells. Any model in the Bolex H-8 line can be fitted with an electric drive by the importer, Paillard, Inc.

The best news that I can offer to most of you is regarding 8mm film. Professional film is available from the Superior Bulk Film Co., 450 North Wells.

Chicago 10, Illinois. Send for their free cine manual. Eastman Plus X speed index is ASA-64. Tri X Reversal ASA is 250-500. Color film is also available.

Do I need a filter, is the most frequent question. There are three general uses for filters. (1) . . to change the color quality of the exposing light in order to secure proper color balance with the film. Recommendations for the proper correction filters are in the box of film you purchase. (2) . . to introduce deliberate departure from normal color balance, either to enhance the mood of the scene, or to satisfy the personal preference of the photographer. (3) . . Color Compensating filters (cc) to compensate for strong red absorption of sea water in underwater photography using color film. The red CC filters are suitable for this use. More specific than this, red absorbs blue and green and we can use a CC-05R, CC-10R, or CC-20R with an exposure increase of one third F/ stop. The number represents density. The CC-30R is darker than the CC-05R, and will absorb more of the blue and green. The CC-30R and CC-40R will require two thirds F/ stop exposure increase. Which CC-R should you use? In my opinion this will depend on the effect you wish to have. I like a picture which gives an underwater effect and projects a mood sensation that I receive while diving. If you have footage that you like without a filter, don't use a filter. Should there be too much of a blue-green cast to suit you or the average audience, try filtering. I suggest buying a CC-10R gelatine filter and trying it on a few scenes. Should you desire more correction, try the CC-30R. After this testing you will be able to determine which of the five you prefer. 

(Editor's note: Skin divers seeking answers to photographic problems are invited to address their inquiries to Mr. Brooks, in care of Skin Diver Magazine. While it is not possible to reply to each letter individually, he will answer your questions in future columns on underwater photography.)

COASTAL CHARTS CHANGE FREQUENTLY

Washington (Don Byers)—The Coast and Geodetic Survey Director has some advice for amateur adventurers who plan to use Survey charts.


Admiral Karo tips us off that veteran travellers wait until **SHORTLY BEFORE** leaving to buy charts, to assure the latest possible information.

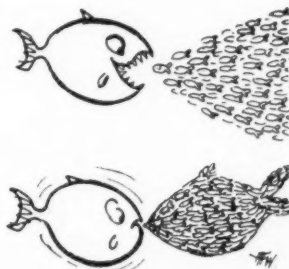
Changes in landmarks, aids to navigation, and submerged obstructions necessitate frequent revisions and corrections on modern charts. Without up-to-date information, the charts become obsolete and hazardous to use.

In order to keep up with changes, the Coast and Geodetic Survey made more than 8,000,000 hand corrections on the nautical charts last year. By the time a chart has accrued 40 hand corrections, the survey makes a new printing. This happens to more than half the water charts each year.

It's hard to keep ahead of the Survey's work. A helpful skipper sent in a chart with pencilled-in soundings indicated for a blank area on his chart. A closer look showed that the area had been surveyed and charted completely—and the skipper was already several years out of date.

So you can keep track, lists of "Dates of Latest Prints" are available from any of the 411 sales agents who handle charts. The weekly "Notice to Mariners" is also helpful, and Coast Guard District Offices publish Local Notices to Mariners. It's wise to check.

But if you insist on doing it the hard way, the Coast and Geodetic Survey has on file a large number of original copperplate engravings of early editions—some of which go back to the 1850's. More than 70 are available at prices ranging from \$1.00 to \$2.50. 



Scare and be scared.

(from the Hong Kong Underwater Club)



Scott

HYDRO-PAK

SCOTT AVIATION CORP.

8301 Erie Street

Lancaster, New York

SCOTT Aviation Corporation was founded by Earle M. Scott in 1932. In the earlier days, Scott was primarily an aviation accessory manufacturer. With the advent of World War II, Scott began manufacturing high altitude oxy-

gen equipment and today enjoys the reputation of being the world's largest manufacturer of self-contained demand breathing apparatus.

After World War II, Scott realized the necessity of building products for the commercial market, so with the "know-how" obtained during the war years, developed the Scott Air-Pak which was designed as self-contained demand breathing equipment for use by firemen and industrial workers requiring respiratory protection at atmospheric pressure.

It was soon discovered that with proper training the Air-Pak could be used underwater, safely, for short durations.

In 1950, the Royal Canadian Navy approached Scott to develop a scuba unit and with the vast experience in the self-contained breathing apparatus field, Scott developed the Hydro-Pak, which today is considered one of the best of its type.

The men at Scott responsible for the development of the Hydro-Pak are H. A. Benzel, Vice-President and General Manager, A. E. Miller, then Chief Engineer, now Director of Research, and Charles Cupp, Assistant Chief Engineer. Both H. Benzel and C. Cupp are active skin divers and have visited most of the more exciting waters around the North American continent.

Early in 1953, when skin diving was rapidly becoming a national sport, Scott began marketing the Hydro-Pak through sporting goods dealers and today are receiving their share of this market, as well as enjoying sales to the industrial, fire department and police department markets.

At the present time, Scott has three sales divisions in its company, the Commercial Products division, Civil Aviation Division, and the Military Division.

The Commercial Products Division, headed by L. E. Jordan, handles the Scott Hydro-Pak, Air-Pak used by industrial workers and firemen, the Scott Demand Respirator, also used in industry, the Scottoramic full vision face piece, and the Scott Demand Inhalator, used by doctors, ambulance operators, hospitals, fire departments, industrial plants and individuals.

The Civil Aviation Division has numerous accessory items for small aircraft, such as control wheels, tail wheels, and brake cylinder valves, as well as high altitude oxygen equipment used by both private and commercial aircraft owners.

The Military Division of Scott is continually doing research and development work on high altitude oxygen equipment for military aircraft and at present are in production of oxygen equipment being used on our latest military fighters and bombers.

Breathing equipment represents ap-

proximately 90% of Scott Aviation's business and the very complex research and development work being done today will result in better breathing equipment tomorrow for the military as well as commercial markets.

HYDRO-PAK METHOD OF OPERATION

To illustrate how these principles have been applied, the operation of the Hydro-Pak will be described during the breathing cycle of inhalation and exhalation. The flow of compressed air during inhalation is shown in Figure 1 with the actual position of all valves indicated. The flow of exhaled air is shown in Figure 2 with the actual positions of all valves indicated.

When the Hydro-Pak is completely assembled and ready for operation with the air cylinder valves closed, the normal position of the other valves is as follows: The diaphragm and valve disc of the exhalation regulator are closed. The demand valve and demand check valves are closed with the diaphragm positioned at the end of the demand valve stem. Within the first stage regulator assembly, the air reserve valve is closed, and the pressure regulating diaphragm is forced inward because of the pressure adjusting spring. The displaced diaphragm holds the valve assembly open. This valve assembly controls any air flow to the demand regulator.

When the diver opens the air cylinder valves, the high pressure air flows from the cylinder into the first stage regulator assembly to the air reserve valve. When this pressure is greater than 400 p.s.i., the air reserve valve will be forced open.

The high pressure air then passes through the reducing valve assembly until the pressure in the space beneath the pressure regulating diaphragm becomes great enough to overcome the force of the pressure adjusting spring. The diaphragm rises, allowing the valve assembly to close and remain closed until the pressure in the air supply hose is reduced by inhalation. The air pressure in the air supply hose is now approximately 100 p.s.i. greater than atmospheric pressure.

HYDRO-PAK OPERATION IN ATMOSPHERIC AIR:

The Hydro-Pak will have atmospheric air pressure on the diaphragm of the demand regulator and on the diaphragm of the pressure regulating valve.

As the diver inhales (Fig. 1) he reduces the pressure in the mask. The air within the demand regulator, being at a higher pressure, forces the demand check valve open, and the demand regulator pressure falls. The atmosphere air pressure on the diaphragm is now greater than the demand regulator pressure, and forces the diaphragm inward. The diaphragm opens the demand valve

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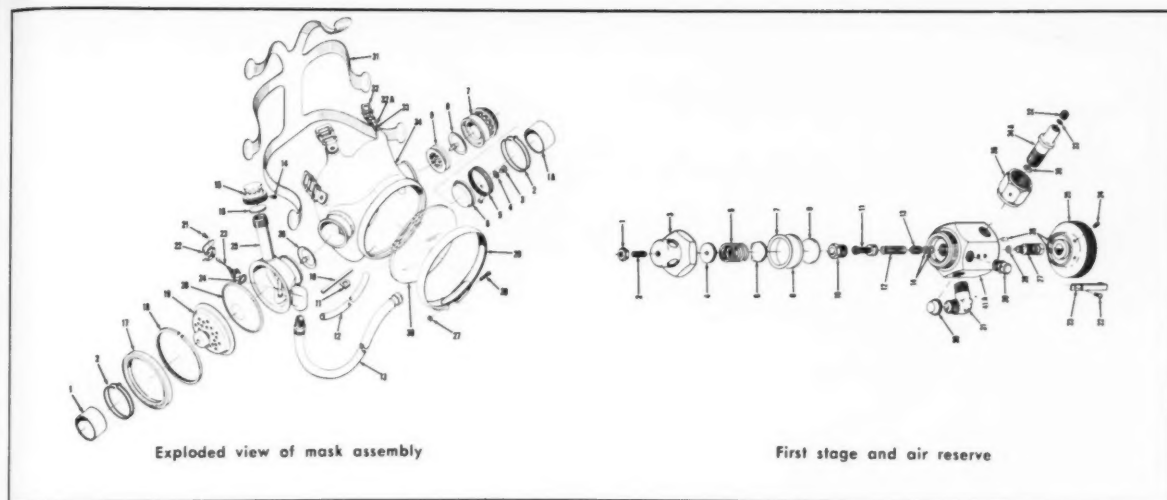
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allowing the air from the first stage regulator to flow into the mask. As long as the diver inhales, the air from the demand regulator assembly will flow into the reduced pressure of the mask. When the diver stops inhaling, the flow of air through the demand valve into the regulator equalizes the pressure within the regulator with the ambient atmospheric pressure. The diaphragm returns to its normal position, allowing the demand valve to close. The pressure within the demand regulator, the mask, and the exhalation valve diaphragm is now equal to the ambient atmospheric pressure.

The exhalation valve disc will not allow air to escape from the mask until the pressure within the mask is slightly greater than the pressure against the exterior of the disc.

When the diver exhales (Fig. 2) he increases the pressure in the mask. The higher pressure air cannot flow into the demand regulator because of the demand check valve. Therefore, this air will force the exhalation valve disc open and pressurize the diaphragm of the exhalation regulator. The pressure on the other side of the diaphragm is the same as in the demand regulator. The pressure within the exhalation regulator, being greater than the opposing pressure on the diaphragm, will force the diaphragm open and allow the air to escape to the atmosphere.

HYDRO-PAK OPERATION UNDERWATER

It will be assumed that the demand and exhalation valves of the diver's mask are 33 feet below the surface of the water. This depth of water will exert a hydrostatic pressure of 14.7 p.s.i. (in addition to normal atmospheric pressure) on the diver and Hydro-Pak. This pressure will be impressed upon the diaphragm of the first stage regulator and upon the diaphragm of the demand regulator.

When the diver inhales (Fig. 1), the

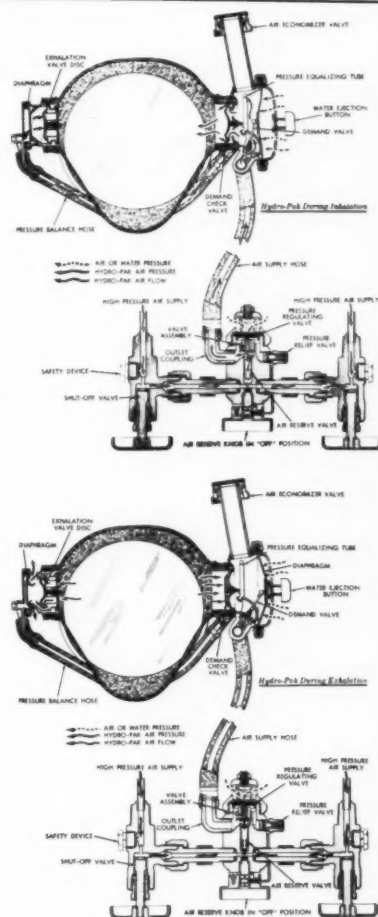
action will be the same as described for atmospheric air, except that the air delivered from the first stage regulator will be at a pressure one atmosphere (14.7 p.s.i.) greater. The air delivered through the demand regulator and thence to the mask will be at twice atmospheric pressure, and therefore will be twice as dense as atmospheric air. The action of the hydrostatic pressure on the diaphragm of the first stage regulator maintains the pressure of the air delivered to the demand regulator between 100 and 125 p.s.i. greater than the depth pressure. Thus, as the depth increases, the pressure (and therefore the density) of the air delivered to the demand regulator also increases. This allows the demand regulator to supply the diver with air of the correct density to meet his needs at varied depths.

When the diver exhales, the action will be the same as in atmospheric air if the demand regulator and exhalation regulator are in the same depth. If at any time, the demand regulator is deeper than the exhalation regulator, as when a swimmer turns his head to the left, the pressure within the demand regulator is transmitted through the pressure balance hose to the exhalation regulator. The pressure forces the diaphragm against its seat and prevents the loss of air by sealing the exhalation outlet until the pressure within the mask is slightly greater than the hydrostatic pressure against the demand regulator diaphragm.

HYDRO-PAK SERVICE AND MAINTENANCE

Mask Assembly: After each use, particularly after use in salt water, inspect the entire mask assembly and rinse it with clear, fresh water.

To open the demand Regulator, remove the rubber guard ring, lift one end of the stainless steel retaining ring and remove the ring from the Regulator housing. Remove the rubber diaphragm and inspect for wear. Rinse all parts of



the mask assembly in fresh water.

Regulator Assembly: Inspect all threads for damage after removal of cannisters.

Air Cylinder: Do not completely empty air cylinder as a slight positive pressure helps keep the cylinder internally clean.

Harness Assembly: Inspect all webbing for breaks in sewing or excessive wear.



Diving Equipment and Compressed Air Stations—a national listing to serve the local and traveling diver. Advertising rate is \$30 for 6 ads. taken on a semi-annual basis—Jan. thru June and July thru Dec. Payment must accompany copy. Send all material to Compressed Air Stations, c/o Skin Diver, Box 111, Lynwood, Calif.

All prices are for 70 cubic foot cylinders. Listed Alphabetically by States and Cities.

ARIZONA

HOLLENBECK MARINE EQUIPMENT CO.
2651 S. 19th Ave.
Phoenix, Arizona
Hrs. Daily 8 a.m. - 8 p.m.

\$1.50

SPORTS SPOT

4226 E. Indian School Road
Phoenix, Arizona
Hours: 9-6

\$1.50

CALIFORNIA

SKI N' DIVE

14610 Lakewood Blvd.
Bellflower, Calif. — ME 4-1221
Open every day 9-7; Fri 9-9

\$1.25

SUNLAND SPORTS LODGE

332 North Canon Drive
Beverly Hills, Calif.
Hours: 10-9 Mon. thru Sat.

\$1.25

DEE SPORTING GOODS

1714 1/2 Whitley Ave., Hollywood &
1707 W. Magnolia Blvd., Burbank
9-6 daily except Sun. 9-9 Mon. & Fri.

\$1.25

AL'S SPORTING GOODS

Highway One at Pier
Cayucos, California Phone WY 5-3748
Hrs. 7-9

\$1.25

LOUIE THOMAS MARINE CENTER

343 So. Atlantic Blvd. Cert. air
East Los Angeles, Calif. AN 3-0974
Hrs. 9-6; Tues & Fri to 9 p.m.

\$1.25

JOYCE SEA SPORTS

15248 Crenshaw Blvd.
Gardena, California
Hrs. 9-7 Closed Tuesday

\$1.25

LAGUNA SEA SPORTS

680 N. Coast Blvd.
Laguna Beach, Calif.
Hrs. 9-5:30; Sat & Sun 8:30-5:30; Closed Wed.

\$1.25

UNDERWATER SPORTS SHOP

5914 E. 2nd Street
Long Beach, Calif.
Hours: 9:30-6:00, Open 7 days

\$1.25

PENGUIN, INC.

2493 Atlantic Ave.
Long Beach, Calif.
Hours: 9-7 & Sun. 7-12

\$1.00

AQUA-DIVERS

1901 Pac. Coast Hwy. (Along P.V. Hills)
Lomita, Calif. DA 6-6663
Hours: 9-9, 7 days a week

\$1.25

AQUATIC CENTER

4323 W. Coast Hwy.
Newport Beach, Calif.
Hrs. 9-8, 7:30-8 weekends

\$1.25

LYLE A. HOSKIN & SON

Water Sports Eqp't. Co., Inc.
1220 West Coast Hwy.
Newport Beach, Calif.
Hours: 9-6

\$1.25

CAL-AQUATICS

7417 Lankershim Blvd. — POplar 4-7344
North Hollywood, Hrs. Fri. Sat & Sun 9-9
Mon. thru Thurs. 9-6

\$1.25

STEELES SPORTING GOODS

5815 College Ave.
Oakland, Calif.
Hrs. 9:30-6; Thurs till 9 p.m.

\$1.00

FRANCIS BROS. SPORTING GOODS

1811 So. Hill Street
Oceanside, California
Hrs. 8-6, Sun 9-5, Cert. air

\$1.25

SPORTLAND

406 South Lake Avenue
Pasadena, Calif. Certified air
Hrs. 9-5:30 Mon-Thurs.; Fri. 9-9:30

DIVE N' SURF

504 No. Broadway
Redondo Beach, Calif.
Hours: 9-6 closed Tues. 12 fills \$10

MEL'S AQUA SHOP

1911 So. Catalina Ave.
Redondo Beach, Calif.
Hours: 9:30-6:00

\$1.25

SAN DIEGO DIVERS SUPPLY, INC.

4042 Midway Drive
San Diego 10, Calif.
Hrs.: 9-6, 7 days a week. Certified Air

\$1.25

SURF SHOP

2686 Great Highway Lombard 4-4077
San Francisco, Calif.
Rix Water Pumped Air

ART'S AQUA SHOP

328 East 14th Street
San Leandro, Calif.
Certified Air

\$1.00

THE DIVERS DEN

725 Chapala St.
Santa Barbara, Calif.
Hrs. 6-9 p.m., Sat & Sun. 8 a.m. to 6 p.m.

\$1.25

THE AQUA MARINE SHOP

896 Circle Drive
Santa Clara, California
Hours: 9-6; Sat. 9-1

WATER GILL PRODUCTS

2547 Lincoln Blvd. EXmont 1-1210 - TE 0-8808
Venice, Calif. 70 cu. ft. \$1.25
7 days a week 9-6, Fri. till 9; Certified Air

CONNECTICUT

NEW HAVEN DIVING CENTER, INC.

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HIGH PRESSURE AIR COMPRESSORS

(Continued from page 41)

war Ingersoll-Rand and Worthington manufactured according to government specifications this type compressor, used by the Air Force in ground servicing units for hydropneumatic charging. Ingersoll-Rand manufactures the 3321 three-stage, four-cylinder compressor, which has a 25.02 displacement at 900 KPM and is rated at 2000 PSI (will safely overload 15%). Operating this compressor at 900 RPM necessitates a 30-minute duty cycle, 30 minutes running and 30 minutes cooling; it can however be operated continuously at 600 RPM. The Ingersoll-Rand compressor has two 3 1/2" cylinders in the first stage, one 2 1/4" cylinder in the second stage, and one 1" cylinder in the third stage, with a 2 1/2" stroke (written 3 1/2 x 3 1/2 x 2 1/4 x 1 x 2 1/2). The brake horsepower of this compressor is 10.7 operating at 900 RPM, or one can figure approximately 1 horsepower for every 90 RPM.

Compressors similar to the 3321, also made by Ingersoll-Rand, are the 3310 and the 15T3. The 3310 is different from the 3321 in that the second stage has a 1 3/4" bore and the third stage a 3/4" bore (written 3 1/2 x 3 1/2 x 1 3/4 x 3/4 x 2 1/2). It is rated at 3000 PSI, but the charging time is a little longer with the 3310 since it is operated at 600 RPM.

The 15T3 is a three-stage compressor rated at 3500 PSI and is a slightly smaller compressor than the 3321 or the 3310. Ingersoll-Rand has just recently added to this series of compressors the 4R15G, a four-stage compressor rated at 4000 PSI; this compressor was also built to government specifications.

Worthington built for Uncle Sam the V4A3, a three-stage, four-cylinder compressor similar to the Ingersoll-Rand 3310. The V4A3 is rated 3000 PSI at 700 RPM for intermittent operation; the dimensions are 3 1/8 x 3 1/8 x 1 3/4 x 3/4 x 2 3/4. Worthington has just recently added a new compressor in this class, the V4A4 four stage, which has a maximum pressure of 3500 PSI. They also make a modification of the V4A4 which goes to 9000 PSI.

Joy Manufacturing Co. recently entered the race for supplying Uncle Sam with a small high pressure air compressor unit. This company makes the Model 15HGP (bare compressor Model 15HG), four stage, four cylinder type rated at 3500 PSI.

The best of these compressors for scuba cylinder charging are the Ingersoll-Rand Models 3321, 3310, and 15T3, and the Worthington Model V4A3. The newer type compressor units, Ingersoll-Rand Model P4R15G, Worthington Model V4A4P, and Joy Model 15HGP,

operate between 1500 and 1800 RPM to equal the displacement of older type compressor units. We can readily see that the older units operating at 600 to 900 RPM will last longer than the newer types. These new compressor units, the majority of which are being bought by the Air Force to start jet aircraft, will probably not appear on the surplus market for the next two to five years, that is, not in any great number.

Manufacturers' ratings should be strictly adhered to when operating compressors for cylinder charging. The Ingersoll-Rand 3321, 3310, 15T3, and the Worthington V4A3 will tolerate a 15% overload; but overloading above this 15% over a period of time will result in serious trouble.

After pouring many words and much thought over compressors and units, let us see what in conclusion would be the specifications for a compressor unit best suited both ideally and practically for the skin diving sport. How about a two brake horsepower compressor unit weighing approximately 175 pounds, small enough to fit in the trunk of an automobile and light enough for two men to easily load it. It should be able to charge the "seventy" in eighteen minutes or less. This compressor would operate at 900 RPM instead of 3600 RPM, have a maximum pressure of 3000 PSIG, and last from fifteen to twenty years. Also an optional feature would be an extra hose on the air intake so that one could attach a bottle of Scotch or Bourbon, thereby offering a choice of either country-fresh air or country-fresh air, Scotch or Bourbon flavored.



Pablo Libero of Kona

By DONNA MATSON

It was on the Kona Coast of the island of Hawaii that I met Pablo, one of the top Hawaiian skin divers. Pablo has dark flashing eyes, bronze colored skin, and an alertness of life not too often found in the islands where the usual theme of the day is leisure and take-it-easy living. He spends more of his life in the water than out, and living so close to nature has a natural constant awareness of the weather, the winds, and of his beloved ocean . . . of her currents and tides, temperature and color, swells and chop. All these things are important for they effect the crabs to be caught, the shells to be dived for, and the fish to be speared.

I was new to the islands and a novice diver so I thought best I find a local and experienced diver to go with at least the first few times. This was how I came to know of Pablo and talked him into taking me diving with him one day. The local curio shop was low on their shell supply, so he had planned to do some shell diving that morning. He told me to grab my gear, and soon

we were paddling from shore in his outrigger canoe. Not too far from shore we glided to a stop in crystal clear water of about fifty feet. The bottom was sandy and barren. No reefs, no coral, and in Hawaiian waters there's no kelp or seaweed.

Now we were swimming the canoe down the coast and looking for shells. The whole area seemed the same. A flat hard sandy bottom. No rocks or reefs, no marine plants. I wondered if there were any shells in an area like this, and if so where were they. Pablo explained to me how shells had different habits. Some lived in the reefs while others were found only in sand, like the augers and cone shells. These shells buried themselves in the sand during the day, but came out at night to feed. As they move over the sand the foot dragging the shell leaves a thin line or trail in the sand.

When daylight comes it digs itself down into the sand, safe from its enemies. The shell trail is what the diver

(Continued on page 60)

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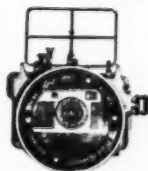
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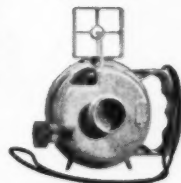
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SOUTHERN PACIFIC ASSOCIATION COMPETITION DATES ANNOUNCED

The following dates have been set by the SPA-AAU Committee for the 1959 underwater spearfishing competitive season. All clubs interested in further information and registration in the competitions should attend the Committee meetings held the first Wednesday of each month at the Roosevelt Park Clubhouse, 7600 Graham Avenue, Los Angeles, California. Submitted by John Geiszler, Chairman.

Eliminations — May 10, 1959 — Salt Creek area, Laguna Beach, California.

SPA-AAU Championships — May 24, 1959 — Location to be decided.

Pacific Coast Championships — June 14, 1959 — Location to be decided.

The National Competitive AAU Skin Diving Committee has announced the following dates, all events will be held at the Grand Bahama Club in the Bahama Islands.

National Women's Championships—July 10, 1959.

National Men's Championships—July 11, 1959.

Open International Championships—July 12, 1959.

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SCIENCE for Divers

By ED GUERNSEY, JR.

Many of the letters coming in to the column concern preserving fish and other marine animals. The following methods have been tried and tested.

Students and home collectors interested in preserving clams first kill the animal by wedging wooden pegs between the shells and then drop the whole clam, shell and all, into a 10% formalin formula. The clam may then be transferred to another 10% formalin formula for preservation.

Different species of fish always make an excellent conversation piece. Kill the fish in a 100% formalin bath, then fix the fish in a 10% formalin bath and inject this same 10% into the body cavity. The fish can then be preserved in beautiful shape in an 8% formalin formula in an appropriate container.

Corals are found in warm salt water, collected with a brick hammer or geology pick, fixed in a borax solution for 24 hours, washed in fresh-water and set to dry. Starfish, sand dollars and sea urchins are dropped in full strength formalin, washed in fresh-water and dried. Sea cucumbers are killed in 10% formalin, body injected, fixed in 10% formalin and preserved in Zenker's Solution or the F.A.A. formula.

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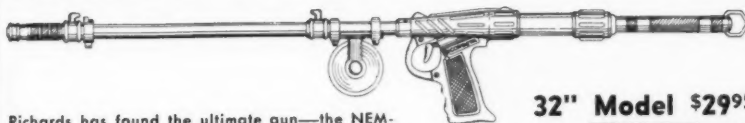
Water	100 cc
Glacial Acetic Acid.....	5 cc
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F.A.A. FORMULA

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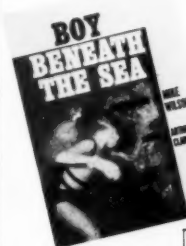
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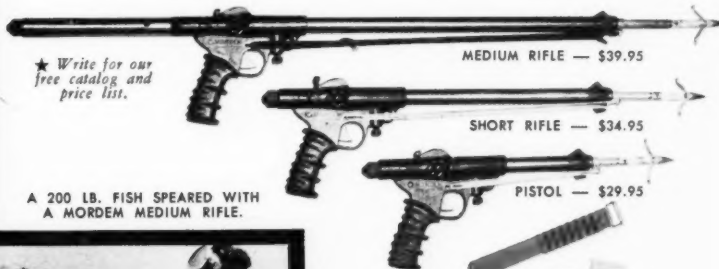
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OCCUPATION SKIN DIVER

(Continued from page 56)

looks for when hunting sandy bottom shells. And this was what Pablo's eyes were searching the bottom for. We had covered quite an area when suddenly Pablo stopped, took a breath and dove to the bottom. He dug his hands down into the sand, then glided to the surface. In his outstretched hand was a shell. A spotted auger. A perfect specimen and a shell collectors prize. Each dive was rewarded with a shell. He never missed.

One of the most interesting days I spent with Pablo was the time he spotted an octopus in about fifty feet of water. The bottom was flat, sandy, and barren except a mud domed-shaped structure. I saw no octopus but apparently Pablo knew what he was doing. He put his spear in the canoe and dove for the bottom with his bare hands his only weapon. I followed him down about twenty feet to get a better view. He grabbed hold of the mud structure and pulled it loose from the bottom breaking it in two. Mud, sand, and black ink filled the water and I couldn't see a thing. I was breathless and so I came to the top for another breath of air, then dove down for a second look. All I could see at first through the inky turbulent water was flippers, tenacles, and black hair. I knew he had nothing but his bare hands, and I feared he was in danger. Why was he staying down so long? I tried to go deeper but my head felt as if it would split open. My ears ached and my eyes throbbled. I was useless. Then I remembered the spear in the canoe. I would drop it to him hoping he would see it as it fell to the bottom. I took the spear from the canoe and dove down but just as I was going to drop it I saw Pablo coming up towards me, in his hand he had the octopus waving it about in the water holding it away from his body. We climbed into the canoe and I grabbed my camera. I wanted to take a nice picture of the octopus with its tenacles all spread out. But Pablo told me to hurry so he could kill it. I couldn't see why he was in such a hurry to kill it. It didn't look dangerous, its arms didn't span more than three and a half or four feet. How could it squeeze or strangle a person? Pablo explained the danger of these small octopus is not only did they bite, but if they got a hold near your face that in a few seconds their tenacles would find their way into an opening such as your mouth, eyes, ears, and nostrils and in this way could suffocate you. If a diver cut off the tenacles the end could remain in the openings holding on for some time with the suction cups. Understanding now why the octopus must be killed immediately I reached for the

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Donna Matson aboard a skin diving boat at Catalina Island, California. Miss Matson is a world traveler and is presently in North Africa.

knife and handed it to Pablo. But his hands were full. He pulled up a lid or layer of skin under the octopus's eyes and turned it inside out, and then he bit as hard as he could between the octopus's eyes. The waving muscular tentacles relaxed and then hung limp from the body. Pablo dropped it to the bottom of the canoe.

"What did you do?" I asked.

"I killed the octopus," he replied.

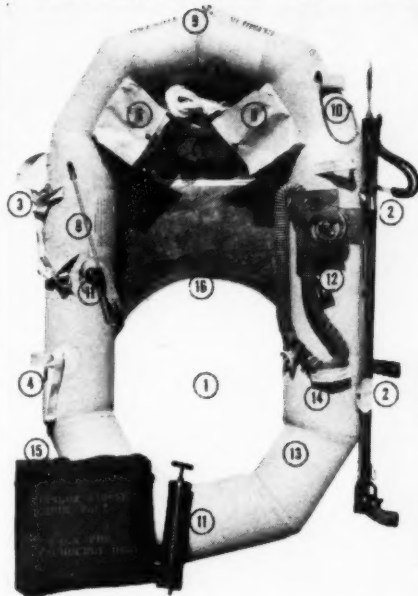
"Do you always kill them by biting them?"

"Usually. The quickest and surest way to kill an octopus is to destroy its brain which is located between his eyes. It takes two hands to hold him, so you can't do it with a knife, so you bite him."

In the islands octopus meat is a delicacy and Pablo was able to sell it for a good price.

One afternoon I saw Pablo and a friend coming in from diving, so I went over to see how they had done. Pablo showed me a string of fish and said he hadn't done too well, then went over to clean out his canoe. His friend told me how Pablo had followed a big Alua into a cave and had encountered an eel. He speared it and started to leave the cave when another eel about four feet long appeared in the opening blocking his way. He had to either drop the spear with the eel and be defenseless or spear the second eel. Since the eel was the spotted variety and quick to attack, he decided to spear the second one. Two eels speared in one dive. He hardly had a chance to catch his breath when an eight foot shark appeared on the scene. Just an average sized one for Hawaii, but anyway a shark. He speared and killed it. All in a day's work. Not even important enough to tell about when I asked how diving had been. And so goes the life of Pablo whose occupation is a skin diver.

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ILLINOIS NOTICE

The Illinois Council of Skin Divers is holding their Second Annual Banquet on Tuesday, February 3, 1959 at the Elmhurst Country Club in Chicago. Festivities begin at 7 p.m. and tickets are \$6 each. Highlight of the banquet will be the guest speaker, Capt. J.-Y. Cousteau. Tickets are available from any board member of the Illinois Council or Vern Pederson, 1641 West Irving Park Road, Chicago 13, Ill. Telephone Wellington 5-1760 for further information.



GENE WHEELER

J. W. Mahanay, Sales Manager of The Cornelius Company, recently announced the appointment of Mr. Gene Wheeler as sales representative for Cornelius portable compressors. Wheeler will assume direction of the sales program in the industrial, sports and fire department fields.

"COAST PILOT FIVE"

Washington (Don Byers)—"Coast Pilot 5" has just been issued in an entirely new 286 page format, covering all information previously requiring more than 800 pages.

The Coast and Geodetic Survey publication covers the Gulf Coast of the U. S. from Key West to the Rio Grande, Puerto Rico and the Virgin Islands.

Coast Pilot is a combination atlas, encyclopedia, geography text and nautical guidebook in one attractive package. It can be of use to the small boat skipper or the captain of a cruise liner. Information such as port descriptions, directions for coasting and entering harbors, weather conditions, navigation regulations, radio service, supplies and repair facilities and even local curiosities is crammed into the meaty volume.

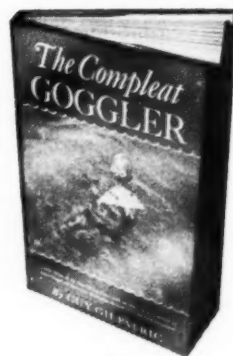
For example, the book notes a boiling spring located close to shore near Dunedin, Florida — and extensive tortuous caves on Isla Mona in the West Indies (18°5'N., 67°54'W.)

"The caves were used as hideouts by pirates for nearly three centuries," says the good book.

Coast Pilot 5 is available at the sales agents, district offices, and Washington office of the Coast and Geodetic Survey for \$2.50.



Here is the first book ever written about "Goggle Fishing," now known as Skin Diving, the classic in the field. Mr. Gilpatric tells exactly how it is done and gives full details, drawings and photographs of the spears and goggles. A new section by James Dugan brings it up at date on the latest equipment.



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DINING FOR DIVERS



by Allan Petri

I don't like Moray Eels when I'm diving. I hate Moray Eels when I am diving for lobster. I frankly think they feel the same way about me. But, get them out of water and clean them, then eels and I get along fine.

My Italian friends call them Anguilla. And what the Italians can do to an eel as a way of culinary art, is something worth trying. Here is one way that I tried with an eel someone else caught. You will need:

One eel (about a 2½ pounder)
One small sliced onion
Two cloves of garlic
One cup of fresh mushrooms (separate caps and stems)
One tablespoon of tomato paste
One cup of sauterne
¼ cup of olive oil
2 cups of Italian beans (frozen is good)
½ cup of water
salt and pepper.

Cut the head off the eel and clean it thoroughly (the rest of the eel, not the head). Soak it in ice water for at least a quarter of an hour. Put the olive oil and the onion in an iron skillet and brown the onion. Add the eel and cook until the eel dries out. Then add the mushrooms and salt and pepper to taste and simmer for five minutes. Now add the wine, garlic, and beans, cover the pan and cook until the wine is almost gone. Add the tomato paste and a little water and simmer until done. The eel can be cut into serving pieces about three inches long either before cooking or on the serving platter. If your guests are squeamish, better cut it first.

This is another way of preparing it that you will find in most Italian Antipasto. It goes by the name of Capitone and is served cold. You will need:

One eel (again a 2½ pounder)
2 cloves of garlic mashed
3 bay leaves
one cup of olive oil
one cup of red wine vinegar
three crushed pepper corns
salt to taste

Dump everything in a pot and simmer for half an hour, or longer until the eel is tender. Cut it into serving pieces and place it on your serving platter. Strain the juices over it and chill it in your icu boxa (Italian for refrigerator) for at least three hours before serving.

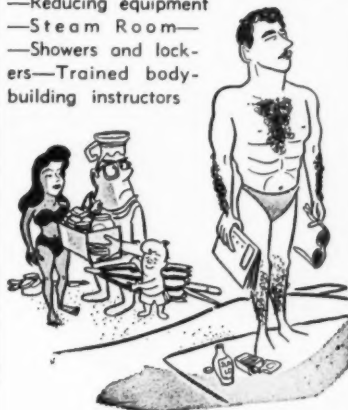
One comment on eels generally. It takes at least a 2½ pounder to do justice to the meat. It should be skinned and cleaned thoroughly. Some people remove the backbone, but if you do be most careful not to damage the meat.

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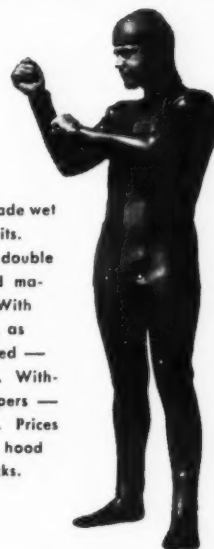


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NEW WESTMINSTER, BRITISH COLUMBIA, CANADA—A French diver, Louis Lourmais, became the first man to swim the Fraser River from Prince George to the coast. Swimming the nearly 600 miles through wilderness rarely seen by man, Lourmais often had to smash through the ice with his fists. The diver emerged from the 17 day swim scarred and battered from the ordeal.

FORT WORTH, TEXAS—Jerre Hall, a member of the Inland Diver's Association, Inc., in connection with the Haltom City, Texas, Fire Department; at the request of the Police Department of the city of Fort Worth, located and aided in the recovery of a number of safes in the Trinity River. The safes had disappeared from various stores in the city over a period of three years.

SAN FRANCISCO, CALIFORNIA—Twenty-eight members of the Sierra Club, self appointed can pickers, cleaned up litter from the Kearsarge Pass and Bullfrog Lake area. They filled 150 burlap bags with 26,000 cans (three tons of tin). A special contingent of skin divers added to the collection by removing debris from the lakes in the area.

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Lynwood, California

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BRANDON, MANITOBA, CANADA—Herman Kutzner, Keith Hurst and Bill Sallows assisted police in recovering an auto containing two passengers from the Assinaboine River. The diving was done in near freezing weather immediately after the car had plunged through a retaining fence into the river trapping two of the occupants. A third passenger in the vehicle escaped. The trio of divers are members of the Brandon Frogmen Club.

LOS ANGELES, CALIFORNIA—A writer has sued actor Audie Murphy for \$130,750 in a complaint charging non-payment for his work in preparing a script for a projected movie, "Skin Diver with a Heart."

GLENDALE, CALIFORNIA—A Glendale Boy Scout Explorer post may be instrumental in the National Council adopting a new merit badge—for skin diving. Upon completion of 69 hours of sea diving, the post notified the National Council of the program. In recognition, each member of the post was awarded a lapel pin with the notice the program would be taken up by the Council as a possible added merit badge.

MARGARITA ISLAND, VENEZUELA—Pearl fisheries at Margarita Island were a favorite target of Caribbean buccaniers and today skin divers are welcome to any pearls the pirates missed.

POSSUM KINGDOM LAKE, TEXAS—Members of the Inland Diver's Association, Inc., Gilbert Milner and Ray Misenhelder, successfully raised, at the request of the insurance company, a 26 foot, 4700 pound, steel hull, house boat, sunk in Possum Kingdom Lake during a recent thunder storm when winds reached the 70 knot mark. The craft was visible from the surface and once the equipment was installed, very little difficulty was encountered in wenching the craft to shore.

SOUTH AMBOY, NEW JERSEY—Raritan Bay provided the scene for an unsuccessful two day search for a drowned duck hunter. The combined efforts of the New Brunswick area of the Bureau of Navigation, the South Amboy First Aid Squad and the South Amboy Boating Club, were praiseworthy due to the fact that they worked in freezing weather and rough waters. The newly-formed Metuchen Underwater Divers YMCA provided two divers, George and Bob Homa, who worked in cooperation with all three groups, from one of the search boats. The Homa brothers provided an extra service by cutting a drag line tangled in the prop of a search boat.

VENICE, FLORIDA—Divers from Tampa, Lakeland, Sarasota and Venice are seeking the location of a German submarine reported to have been sunk during World War II about 18 miles off Venice. The expedition will be led by Lt. Col. William Royal and Dr. Eugenie Clark, director of the Marine Laboratory at Cape Haze, will accompany the group. She is seeking marine life from the Gulf for scientific study, the rest of the party is searching for the submarine. The Winslow Aqua-Raft, being manufactured at the Sarasota-Bradenton Airport, will be utilized in the search.

NILES, MICHIGAN—Richard Nordahl and Linwell Flake, members of the Water Raiders Inc. of South Bend, Ind., uncovered a safe while diving near Niles. A wrecker was used to pull the safe from the water. Niles police are holding the safe, which has not been claimed.

(Continued on Next Page)

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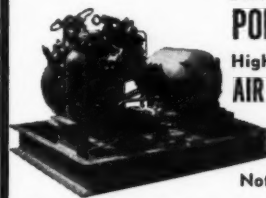
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(Continued from Page 63)

KEY WEST, FLORIDA—Two sailors who were reported missing on a skin diving expedition in October were arrested in Marfa, Texas, for auto theft and armed robbery. A skiff with diving gear was found adrift near Key West and the two sailors were presumed lost.

SAVANNAH, GEORGIA—Paul Garret, who joined in the search for the historic steamship *Savannah*, now has an interesting diving chore in his own backyard. About \$50,000 worth of steel pipe was lost from a *Diamond Construction Co.* barge being towed to the Bahamas. The pipe broke loose in rough weather and rolled off the barge at a point in the Tybee Bar channel about four miles off the beach. The pipe has been located in about 60 feet of water. During the week long search for the pipe, a few ancient anchors were located. These will be surfaced at a later date. Salvaging of the 18 inch pipe which is in 40 foot lengths will commence as soon as the weather clears.

CHICAGO, ILLINOIS—Skin divers searched a slough where the body of *Bonnie Leigh Scott* was found for a weapon or other clues in the murder of the 15 year old girl. Additional lie tests were ordered for a friend of the girl who had failed three earlier tests concerning the murder. The slashed and decomposed body was found nude in a gully nearly six weeks after the disappearance. The divers, headed by *Daniel Wagner*, failed to turn up either the weapon or clothes of the victim.

ROTTNEST, AUSTRALIA—Seventeen-year-old *Sue McDaniel* claims an Australian women's underwater record in a recent dive to 150 feet. Last year the girl finished third in the state diving championships against male competitors.

COPENHAGEN, DENMARK—Three members of the *Skovshoveds Undersøiske Gruppe* discovered the body of a hotel owner who had allegedly committed suicide. This was the first body recovery by the Danish club.

SCRANTON, PENNSYLVANIA—Two skin divers, *Dr. Barry Jordan* and *David Lippincott*, were hired to search the *Lackawanna River* in a search for a safe containing \$400,000 in non-negotiable securities owned by *Edward Muldowney*. The first day's search was unfruitful. The safe was stolen from the *Muldowney* home in October by three *Scranton* men who confessed to the burglary and to dumping the safe into the river. The divers, who finally gave up the search, worked in filthy water. When detectives entered the water earlier in the search, preventive shots against typhoid, smallpox, and other diseases were ordered by the director of public health.

Another new television series about skin diving is being readied by *Herb Shriner*.

FRANKLIN, OHIO—The *Franklin* city government called on the services of diver *Bill Kemper* in a search of the *Miami River* for a break in the sewage lines. *Kemper* located several breaks and reported the water so filthy he couldn't see two inches in front of his mask.

RICHMOND, VIRGINIA—City firemen and *Glenn Bidwell*, a skin diver, teamed up to recover a stolen 150 pound safe from a canal. *Bidwell*, a member of the *Undersea Explorers Club*, located the safe which had contained more than a \$1,000 in cash and checks. The location of the empty safe was revealed by suspects in the burglary.



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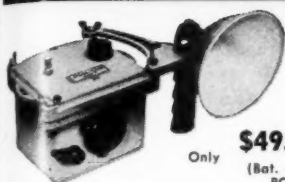
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SALEM, MASSACHUSETTS—Two skin divers, Arthur Channell and Gerald W. Sutherland, were saved from being swept to sea by Coast Guard air and surface craft in a rescue off Baker's Island. The pair were attempting to row their disabled outboard motorboat, buffeted by high swells and winds, to shore when the Coast Guard crash boat came to their rescue. The crash boat was directed to the disabled craft by helicopter.

BAY CITY, MICHIGAN—A body identified as that of Mrs. Bettie Ruterbusch was discovered in her automobile half buried in the bottom of the Saginaw River by state police skin divers. The victim, described as despondent, disappeared in July. Skin divers discovered the sunken auto and victim in mid-November.

FORT LAUDERDALE, FLORIDA—W. C. Brown discovered the coral encrusted cannons and cannon balls of an unknown vessel while diving off Hillsboro Mile and has salvaged several of the large guns. He now is planning a search for another sunken vessel, this time an unidentified submarine located "somewhere" between Palm Beach and Miami.

LONG BEACH, CALIFORNIA—County life-guard skin divers recovered the bodies of two men killed when their light plane crashed into the ocean off the Palos Verdes coastline. Witnesses to the crash said the plane had been stunting at about a thousand feet before crashing into the water. It was reported neither of the men were properly certificated for flying.

KEY LARGO, FLORIDA—Reynold Moody, a skin diver for the Shell Oil Company's research department, was a topic at the Seventh Annual Spinal Cord Conference held in Kennedy VA Hospital in Florida. Moody suffered an air embolism in his spine while ascending from a 200 foot dive off the coast of Key Largo. A cold current at 160 feet caused him to catch his breath. Dr. M. Wilson Searlight described the case as unusual and said the embolism had left the diver completely paralyzed, although partial use of the arms and fingers and some movement of the legs has been regained. Moody had been collecting geological samples from the ocean floor when the accident occurred.

BRISBANE, AUSTRALIA—Dick Jewell, winner of the Australian championships at Tweed Heads with 29 points, is a member of the Underwater Explorers Club of Western Australia. John Driscoll of Melbourne took second place and John Skepper of Melbourne third place in the contest.

WEST PALM BEACH, FLORIDA—An ancient cast iron cannon, believed to be 18 century and reportedly the largest of its type ever found off the Florida east coast, was recovered by four skin divers, George Johnson, Robert Barus, George Wood and Cyril Grammes. The cannon, in extraordinary good condition, has the letter "F" inscribed on it and is believed of British origin.

JAMAICA BAY, NEW YORK—One of the two engines of the Flying Boxcar that plunged into Jamaica Bay killing three Air Reservists was recovered by Navy skin divers.

BOCA RATON, FLORIDA—Lawrence Jeffrey spent three hours in a battle to reach shore, after diving off Jap Rock near the Delray Beach-Boca Raton boundary. Reported missing when he failed to return home in the evening, Jeffrey was exhausted, but otherwise none the worse for his ordeal. He explained that his inner tube had collapsed at sea and he had swam, floated and battled the rough seas in trying to reach shore.

(Continued on Next Page)

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(Continued from Page 67)

DENVER, COLORADO—Artifacts recovered by A. Putnam Humphreys from the Straits of Bonifacio have been donated to the Denver Museum of Natural History. The treasure was brought up in a skin diving expedition off the coast of Corsica. Humphreys is planning another diving trip in the Canary Islands to find positive evidence that his close friend, the late Freddie McEvoy, did not die at sea as the result of a mutiny by a crew of smugglers as had been hinted.

KANSAS CITY, MISSOURI—Skin divers Kieffer Burris and Clarence L. Mowrar of the Kansas City Frogman club, searched the frigid waters of the Kaw River in Lawrence for the weapons in a triple murder. Lee Andrews is being held in connection with the murder of his parents and sister. The divers searched the cold, muddy waters for a rifle and revolver without success.

PACIFIC CITY, OREGON—An eye witness report of the bombing and sinking of a Japanese submarine during World War II has spurred an expedition sponsored jointly by the Statesman and the Salem Aqua Lung Club in a search for the sub in an area near Ocean City. The same group plan to search for another submarine off the coast of Pacific City, Oregon. Fishermen have complained of an obstruction to their nets that wasn't there prior to the war. This obstruction has not definitely been determined as a submarine and the group plan to investigate the obstacle which is located in 195-200 feet of water.

ROCKLAND, MAINE—The drain plug "not in" the galley sink caused the sinking of the Victory Chimes, a \$45,000 three masted cruise schooner, at her Lemonds Cove moorings. Skin diver Harry Goodridge went down outside the hull and found three portholes open. He sealed them with plywood and pumping operations began. As the ship was pumped out, it was learned that the drain had not been plugged in the galley sink, which left a two inch opening for water to enter through the drain. Apparently she took enough water to settle her down to where the three open portholes let in water which filled and sank the schooner. The ship was floated to surface and the task of cleaning up began.

GRAND TURK ISLAND—J. Gilbert Hermans refutes the man eating 200 pound turtle incident supplied by a fellow Islander. Hermans, who participated in the search for the lost diver, corrects the original article thus: The Navy man had been skin diving, not lunging. The 20 lb. turtle impaled on the diver's spear was found in approximately 70 feet of water with the weight belt and fins. There was no autopsy, as such, of the turtle. Hermans points out as a result of the mishap that divers DO have buddy diver, DO have a quick release buckle on all belts, DO carry a sharp knife and DON'T put fourteen feet of line on spears.

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He is also seeking color and B&W photos to illustrate the article. The magazine will pay \$5.00 for B&W prints and \$15.00 for color that is selected. Send glossy enlargements to Tassos with sufficient return postage and addressed envelope if you want prints returned.

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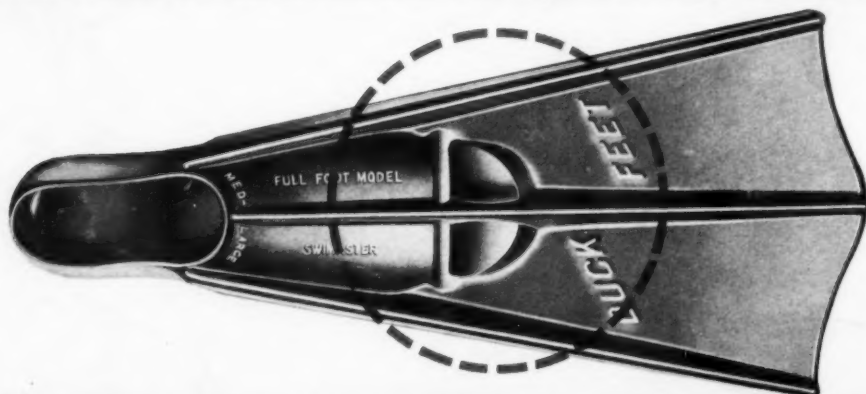
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